

## CONSULTANT REPORT

# APPENDICES TO TRANSMISSION OPTIONS AND POTENTIAL CORRIDOR DESIGNATIONS IN SOUTHERN CALIFORNIA IN RESPONSE TO CLOSURE OF SAN ONOFRE NUCLEAR GENERATING STATIONS (SONGS) ENVIRONMENTAL FEASIBILITY ANALYSIS

Prepared for: California Energy Commission

Prepared by: Aspen Environmental Group



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***Prepared by:***

***Primary Author(s):***

Susan Lee  
Brewster Birdsall

***Aspen Environmental Group  
235 Montgomery Street, Suite 935  
San Francisco, CA 94104  
415-696-5311  
[www.AspenEG.com](http://www.AspenEG.com)***

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***Prepared for:***

***California Energy Commission***

Angelique Juarez-Garcia  
***Contract Manager***

Clare Laufenberg Gallardo  
***Project Manager***

Don Kondoleon  
***Office Manager  
Strategic Transmission Planning and  
Corridor Designation Office***

Roger Johnson  
***Deputy Director  
Siting, Transmission and Environmental Protection  
Division***

Robert P. Oglesby  
***Executive Director***

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# **APPENDICES**

## **APPENDIX A: Detailed Route Descriptions**

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# **APPENDIX A**

## **Detailed Route Descriptions**

This appendix provides details on suggested routing for each onshore alternative and a description of land uses along each route. For the onshore study area, the land uses and jurisdictions drive the constraints, as discussed in Chapter 2 of the report.

This appendix describes the following routes:

- Alternative 2, Alberhill to Suncrest
- Alternative 3, Enhanced TE/VS (Forest Route)
- Alternative 4, Enhanced TE/VS (Talega-Serrano Route)
- Alternative 5, Imperial Valley to Inland
- Alternative 5, Option 1A, 500 kilovolt (kV) Overhead
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- Alternative 6, Valley to Inland
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Alternatives 7 and 8 are substation expansions and are addressed only in the main body of the report.

## **Alternative 2: Alberhill to Suncrest**

Figure 8 on page 62 illustrates the major component of Alternative 2, which is a new 500 kilovolt (kV) overhead from Alberhill to Suncrest Substations (via Warners Substation). The suggested route and the land uses through which it would pass are described below.

### **Alternative 2: Route Description**

#### *Alberhill to Temecula.*

The existing SCE Valley-Serrano 500 kV line would loop into Alberhill Substation.

The new 500 kV overhead line would head south and parallel to the Interstate 15 freeway to the State Route 79 interchange in Temecula. Depending on tower and pole locations, the transmission line could move between California Department of Transportation (Caltrans) property and adjacent private property along the freeway.

Land between Alberhill Substation and the SR 79 interchange is under various jurisdictions, including Caltrans, Riverside County, and the Riverside County cities of Lake Elsinore, Wildomar, Murrieta, and Temecula.

#### *Temecula to Warners Substation*

The route would follow SR 79 for 41 miles, from I-15 to the Warners Substation. A new overhead route would require a 150- to 200-foot-wide new ROW parallel to the state highway. The ROW would cross lands under the jurisdiction of the City of Temecula, Riverside County, San Diego County, Caltrans, and the Cleveland National Forest (CNF). It would cross the Pacific Crest National Scenic Trail near Warner Springs.

#### *Warners Substation to Santa Ysabel Vicinity*

From Warners Substation the alignment would be along SR 79 to its intersection with SR 76, at which point it would leave SR 79. It would pass along the east side of the Santa Ysabel Reservation and continue to Mesa Grande Road, which it would follow southeast before turning due south.

The route would continue in hilly terrain roughly parallel to the west side of SR 79 for roughly 2.5 miles to SR 78, just west of Santa Ysabel. Crossing over SR78, the route would intersect with the existing 69 kV line between Santa Ysabel Substation and Creelman Substation near Ramona.

The route would follow the 69 kV ROW for approximately 3.5 miles before turning south and entering the CNF. The right-of-way (ROW) from Warners Substation to west of Santa Ysabel would pass through land under Caltrans and San Diego County jurisdiction.

#### *Santa Ysabel Vicinity to Suncrest Substation*

Continuing south from the 69 kV ROW, the route passes through CNF and some private lands for about 17 miles. The route crosses over Interstate 8 west of Japatul Valley Road and continues on through the CNF to Suncrest Substation. The ROW between the Santa Ysabel vicinity and Suncrest Substation would cross land under the jurisdiction of San Diego County, CNF, and Caltrans.

### **Alternative 2: Land Uses**

It is assumed that the majority of the northern portion of the route would be in the Caltrans ROW. From the Alberhill Substation south to Nicholas Road, land along the freeway is largely undeveloped except for occasional mining operations. From Nicholas Road to Railroad Canyon Road, land uses along the freeway are principally commercial and retail with some multifamily units. South of Railroad Canyon Road in Lake Elsinore, adjacent development becomes more frequent. From Railroad Canyon Road south through Wildomar, Murrieta, and Temecula, properties along the freeway are largely developed in residential and commercial land uses. There are some light industrial uses as well.

In Temecula, the 500 kV route would leave I-15 and follow SR 79. Beginning at I-15, SR 79 (Temecula Parkway) passes through nearly 5 miles of developed land. There are housing

developments on both sides of the roadway, as well as extensive commercial properties with large parking lots.

Leaving Temecula, the highway turns southeast and traverses open space with scattered agricultural and residential uses. A cluster of development occurs at Holcomb Village, roughly 8 miles northwest of Warner Springs.

Two miles west of Warner Springs, an airstrip is adjacent to the south side of the highway. Warner Springs is a residential village with housing on the east side of the highway and recreational facilities on the west side. Past the village, the highway continues through open landscape to the Warners Substation near San Felipe Road (County Route S2).

#### *Warners Substation to Highway 76*

From Warners Substation to SR 76, the route is in relatively flat, open land. At SR 76, the route transitions to hilly terrain before reaching a flat terrain again near Santa Ysabel and crossing over SR 78. There are a scattered residential properties and parcels used for agriculture and grazing along this segment of the route.

#### *Route 78 to Suncrest*

South of SR 78, the route follows an existing 69 kV line for nearly 3.5 miles through agricultural land before turning south and entering CNF. The route passes by the Capitan Grande Reservation, the Viejas Reservation, and Cuyamaca Rancho State Park and would pass through Boulder Creek Valley north of the town of Descanso. Part of the route would be within roadless areas on the CNF and would cross some private lands as well.

On National Forest lands, the route passes through the following land-use zones but more restrictive land use zones have been proposed, including “proposed wilderness.”

- Developed area interface (about 2.5 miles)
- Back country, non-motorized
- Back country
- Back country, motorized use restricted

### **Alternative 3: Enhanced TE/VS (Forest Route)**

The major components of Alternative 3 shown in Figure 9, page 63 include:

- New 500 kV from Alberhill to Suncrest Substations (via Case Springs, Inland, and Warners Substations).
- 230 kV upgrade from Inland to Escondido Substations.

### Alternative 3: Route Description

Overall, a 500 kV route from Alberhill Substation through the CNF to the Inland Substation would be about 60 miles long. From Alberhill Substation, the new 500 kV line would extend about 32 miles to Case Springs Substation and then an additional 18 miles to Inland Substation. A 500 kV line also would extend west from Case Springs for roughly 14 miles to Talega Substation. From Inland Substation, the 500 kV line would continue south to near Lilac Substation, then head east to Warners Substation before heading south to Suncrest Substation. In addition, two new 230 kV lines would be installed in the ROW between Inland and Escondido Substations

#### *Alberhill to Case Springs*

A 500 kV interconnection between SCE's 500 kV Valley-Serrano line and SDG&E's 230 kV Talega-Escondido ROW would follow a route proposed by The Nevada Hydro Company (TNHC) as part of its Lake Elsinore Advanced Pumped Storage (LEAPS) Project (TNHC, 2011, FERC, 2007).

Because the 500 kV line would link the Talega-Escondido line and the Valley-Serrano line, the interconnection was referred to as the "TE/VS" project. The TE/VS interconnect was proposed to extend from SCE's Valley-Serrano transmission line by way of a TNHC switchyard near I-15 at Corona (Lee) Lake, about 2 miles northwest of SCE's Alberhill Substation site, to a 500/230 kV Case Springs Substation, where it would loop in SDG&E's existing Talega-Escondido 230 kV line. It is assumed that the Alternative 3 alignment would begin at Alberhill Substation, extend north along I-15, then follow the TE/VS alignment. Currently, there is no active application before the California Public Utilities Commission (CPUC) for the TE/VS project.

An application for SCE's 500/115 kV Alberhill Substation is before the CPUC. Information in SCE's application to CPUC was used to identify the substation site location (SCE, 2009). Alberhill Substation is on the north side of I-15, about 1.3 miles west of the Lake Street exit (Exit 81) near Lake Elsinore, Riverside County. Access to the substation would be off Temescal Canyon Road near its intersection with Concordia Ranch Road. The interconnection with SCE's 500 kV Valley-Serrano line would be about 1 mile northeast of the substation site. The 500 kV Valley-Serrano line would be looped into the Alberhill Substation via two 500 kV circuits roughly 150 feet apart. From the substation, the new 500 kV line would run west about 2 miles on private land under Riverside County's jurisdiction then cross over I-15, which is under Caltrans' jurisdiction. It would continue west for 0.6 mile on private land before entering CNF. About 28 miles of the line would be on the CNF. The Case Springs Substation site is on the CNF near the SDG&E Talega-Escondido 230 kV ROW, the western part of which is situated on Marine Corps Base Camp Pendleton (Camp Pendleton).

From Case Springs Substation, the 500 kV line would enter the Talega-Escondido ROW. Jurisdictions crossed by this route include Riverside County, Caltrans, and the CNF.

### *Case Springs to Talega and Inland*

A 500 kV line in the Talega-Escondido ROW would require 14 miles of new 500 kV line in the ROW from Case Springs west to Talega and 18 miles of new 500 kV line from Case Springs east to the Inland Substation. This would establish a Talega-Case Springs-Inland 500 kV circuit.

Between Talega Substation and Case Springs, the ROW is on Camp Pendleton, except for a short length of line in the CNF needed to loop the Talega-Inland 500 kV line into the Case Springs Substation site, which is in the CNF. East of Case Springs, the ROW departs Camp Pendleton near Fallbrook and continues east on private land under San Diego County's jurisdiction. Crossing over I-15, the 500 kV line would terminate east of the freeway at the Inland Substation.

The Alberhill to Case Springs 500 kV line would require new towers in a new ROW. The Talega-to-Inland 500 kV line could be installed as a single circuit on new towers parallel to the existing 230 kV circuit or could be on new towers that would carry both the 500 kV circuit and the existing 230 kV circuit, and the existing towers could be removed.

### *Inland to Escondido (230 kV)*

Two new 230 kV circuits would be installed between Inland Substation and Escondido Substation using the existing Talega-Escondido ROW. This upgrade would result in three 230 kV circuits on two transmission lines between Inland and Escondido. Various line configurations are possible:

- The two new 230 kV circuits could be developed as a new double-circuit line.
- One new circuit could be added to the existing 230 kV line on the vacant side, and a new single-circuit 230 kV line could be added in the ROW.
- One new circuit could be added to the existing 230 kV towers, and the second new circuit could be installed on new towers holding the new 500 kV circuit.
- Depending on design considerations, the existing 69 kV circuit between Pala and Lilac Substations could remain on the spare position on the original 230 kV towers, be underbuilt, or be moved to separate poles.

### *Inland to Lilac to Warners*

For about 11 miles south from Inland Substation, the 500 kV circuit would share the same ROW as the existing single-circuit 230 kV Talega-Escondido line and the new double-circuit 230 kV Inland-Escondido line. Near Lilac Substation, the route would leave the Inland- Escondido ROW heading east. In the existing 230 kV ROW south from Inland, the 500 kV line could be mounted on new single-circuit towers or it could be on double-circuit 500 kV towers with the

other circuit position occupied by one of the new Inland-Escondido 230 kV circuits. This segment of the route is in unincorporated San Diego County.

From near Lilac to Warners Substation, the route would follow 69 kV lines. For roughly 9.5 miles, from Lilac to Rincon, the route follows public roads or goes cross-country. From Rincon to Lake Henshaw, this route primarily is along SR 79. The route would pass through lands under San Diego County, CNF, Vista Irrigation District, and Caltrans jurisdiction.

The following segments are shared with Alternative 2 and are described in the section “Alberhill to Suncrest” above:

- Warners Substation to Santa Ysabel Vicinity
- Santa Ysabel Vicinity to Suncrest Substation

### Alternative 3: Land Uses

#### *Alberhill to Case Springs*

The Alberhill Substation would be expanded to accommodate the Alberhill-Suncrest 500 kV interconnection. The land around the substation site is largely vacant but is hilly terrain.

From Alberhill Substation west to Corona Lake, the 500 kV route would be on private land north of I-15 that is vacant or occupied by commercial and light industrial uses. This area is in unincorporated Riverside County. East of Indian Truck Trail, the route would cross over I-15 and continue southward for about 0.6 mile on private vacant land before entering CNF.

Nearly all of the remainder of the route to Case Springs is in the CNF’s Trabuco Ranger District. The route would climb in elevation, crossing over SR 74 (Ortega Highway) and continuing south and southeast within CNF, roughly paralleling South Main Divide Road (Killen Trail) in the Elsinore Mountains west of Lake Elsinore. The route would be north of San Mateo Canyon Wilderness. Near Elsinore Peak the route would turn south and southwest, roughly following Wildomar Road, skirting the eastern edge of the wilderness before reaching the future Case Springs Substation site. Recreational uses in the vicinity of the route include camping, hiking and equestrian trail uses, and hang gliding. The route also would pass near residential properties on private inholdings in the forest.

#### *Case Springs to Talega and Inland*

From Case Springs Substation, the 500 kV route would enter the existing Talega-Escondido 230 kV ROW. This alternative would require 14 miles of new 500 kV line from Case Springs to Talega in the Talega-Escondido ROW. This section of ROW is on Camp Pendleton, along or near its northern boundary. The land along the route is unoccupied open space in which military training and exercises occur. Talega Substation is partially on Camp Pendleton, with access from Avenida Pico in San Clemente, Orange County. The substation is nearly 1,200 feet from the nearest residences, a cluster of multifamily units in San Clemente. Immediately south

of the substation is San Onofre State Park, which is on land leased from Camp Pendleton through 2021 (Rannals, 2013).

About 1 mile of the Talega-Escondido ROW near Case Springs Substation is immediately adjacent to the southern boundary of CNF and the San Mateo Canyon Wilderness.

From its interconnection at Case Springs Substation, the 500 kV line would continue south and then east in the Talega-Escondido ROW for about 18 miles to Inland Substation. The ROW from Case Springs to Inland trends southeast for 2 miles before continuing due east for 4 miles to the boundary of Camp Pendleton, about 1 mile west of De Luz Road. The northern side of the ROW on Camp Pendleton is bounded on the north by the 1,200-acre Margarita Peak Preserve, administered by the Fallbrook Conservancy. This area is closed to the public and represents a sensitive habitat area. On the south side is mountainous open terrain on Camp Pendleton. The ROW leaves Camp Pendleton and enters private lands north of Fallbrook in San Diego County. The ROW loops south of an extensive nursery operation on De Luz Road and continues east.

For about 5 miles the ROW passes through hilly terrain with open land, agriculture, and low-density rural residential uses. East of Rock Mountain Drive, for approximately 0.4 mile, the ROW is bordered on the south by eight large residential lots, some of which include agricultural and equestrian activities as well. For the next 5 miles, to I-15, the ROW passes through hilly terrain characterized by unoccupied open space with occasional residential and agricultural parcels. Some of this land falls within the southern limits of the Santa Margarita Ecological Reserve, a collaboration of BLM, CDFW, and The Nature Conservancy that is managed by San Diego State University. The ROW is just south of the county line. Crossing over I-15 just north of the Rainbow Valley Boulevard interchange, the ROW passes south of a boat and RV storage area and north of an industrial facility before continuing across open land to Inland Substation.

Between Talega Substation and where the alignment leaves Camp Pendleton near Fallbrook, the property is under Department of the Navy jurisdiction. The balance of the ROW from Camp Pendleton to Inland Substation is under San Diego County's jurisdiction, except Caltrans has jurisdiction over the I-15 crossing.

#### *Inland to Escondido (230 kV)*

Two new 230 kV circuits would be installed in the 21 miles of ROW between Inland Substation and Escondido Substation. Towers for these circuits would be located in the Talega-Escondido ROW in addition to the existing circuit 230 kV line already in the ROW. For about 14 miles, from Inland Substation to south of Lilac Substation, the ROW is in rolling terrain with a mix of open space, agricultural, and rural residential uses on both sides. As the alignment approaches Escondido, the last 7 miles of ROW enters a more developed landscape. At a point nearly 2.4 miles northeast of the Mountain Meadow Road interchange with I-15, the 250-foot ROW is across the street from single-family homes backing on a golf course. To the east is open land and agricultural land. Past this point, for about 2.3 miles, the ROW is along a ridge with open land on both sides. For the next 1.4 miles, the ROW passes through an area of rural residential properties. Entering Escondido near Wildflower Place, the ROW traverses a suburban

residential area for about 0.5 mile before crossing Center City Parkway and entering a mixed-use area of low-density residential and commercial uses for about 0.8 mile.

The ROW then turns southwest just east of Escondido RV Resort on Seven Oaks Road, near West El Norte Parkway. At West El Norte Parkway, parking lots are located in the ROW on both the north and south sides of the parkway. The ROW crosses I-15 south of the interchange with West El Norte Parkway and continues southwest, passing through an area of low-density, single-family and multifamily dwellings to the north and south, and a large church to the south. At Montiel Road, the City of San Marcos' Montiel Park and an associated parking lot are located in the ROW. A pipe storage yard is in the ROW on the south side of the street. Crossing SR 78 (Ronald Packard Parkway), the ROW enters an industrial area. Here the ROW is used for storage and parking. The ROW ends at Escondido Substation south of West Mission Road, off Don Lee Place. The route from Inland Substation to Escondido Substation passes through lands under the jurisdiction of San Diego County, the City of Escondido, and Caltrans. A two-block section of the ROW near the Escondido Substation is in San Marcos.

#### *Inland to Lilac to Warners*

South of Inland Substation for about 11 miles, the 500 kV line would be in the Inland-Escondido ROW with the existing and proposed 230 kV lines. Near Lilac Substation, the 500 kV line would turn east and leave the Inland-Escondido ROW. The 500 kV route would continue east along the existing Rincon-Lilac 69 kV transmission line for nearly 9.5 miles. This part of the route is in rolling terrain with a mix of open space, agricultural, and rural residential uses on both sides of the alignment. From Rincon Substation, located just north of the Rincon Reservation at the intersection of SR 76 with SR S6, the route would generally follow SR 76 for approximately 12 miles to Lake Henshaw. For part of this distance the route would be in the existing Warners-Rincon 69 kV transmission corridor. In this segment it would cross about 6 miles of La Jolla Reservation and 4 miles of CNF land. The hilly route along SR 76 primarily is agricultural/open space with scattered rural residences.

Leaving SR 76 at the west side of Lake Henshaw, the route would be on the CNF for a short distance before crossing open space owned by Vista Irrigation District. Hugging the western and northern banks of the lake, the route would join SR 79 at Warners Substation near San Felipe Road south of Warner Springs. Around Lake Henshaw to Warners Substation, land uses are open space.

The following segments are shared with Alternative 2 and described in the section "Alberhill to Suncrest," above:

- Warners Substation to Santa Ysabel Vicinity
- Santa Ysabel Vicinity to Suncrest

## **Alternative 4: Enhanced TE/VS (Talega-Serrano Route)**

The major components of Alternative 4 shown on Figure 11 on page 65 include:

- New 500 kV from Serrano to Talega continuing to Inland Substation.
- New 500 kV from Inland to Suncrest Substations (via Warners Substation).
- Upgraded 230 kV from Talega to Escondido.

The suggested route and the land uses through which it would pass are described below.

### **Alternative 4: Route Description**

#### ***Serrano to Talega***

A new 35-mile, 500 kV line would be installed in existing ROW between Serrano and Talega Substations. The existing San Onofre-Serrano and San Onofre-Talega 220 kV conductors and towers would be removed and replaced by a 500 kV line on new towers. The corridor between Talega and Serrano does not include an existing circuit directly between these two endpoints.

The San Onofre-Viejo-Chino 230 kV circuit currently on the double-circuit 230 kV towers would occupy the other side of the new 500 kV towers. The existing double-circuit 230 kV towers would be removed.

Jurisdictions between Serrano and Talega crossed by the transmission route include unincorporated Orange County, Lake Forest, Rancho Santa Margarita, Mission Viejo, San Juan Capistrano, San Clemente, Caltrans, and Camp Pendleton.

The feasibility of installing a 500 kV line in the Serrano-Talega ROW has been considered in the past. In 2002, Commonwealth Associates examined the feasibility of installing a 500 kV line in the corridor between these two substations. The study evaluated the addition of a new line and did not contemplate replacing any existing line. During this study, Commonwealth was provided information on facilities and the ROW by SCE. SCE indicated that no additional facilities could be located in the 4-mile-long section of ROW near Talega (Segment E). However, based on the information in the Commonwealth study, it appears that SCE was referencing only its 200-foot ROW, which holds two double-circuit 220 kV transmission lines. Commonwealth's review described the ROW in this segment as being +/- 450 feet, suggesting that it considered both the SCE ROW and the abutting 200-foot SDG&E ROW to the east of SCE's ROW.

Commonwealth concluded that, with some reconfiguring of lines in the congested Segment E area near Talega Substation, it was possible to add a new 500 kV line between Serrano and Talega while retaining the circuits already in the ROW. SDG&E's existing single-circuit 138 kV and single-circuit 69 kV lines would have to be undergrounded so that their poles could be removed to make that part of the ROW available for the new 500 kV line. Alternatively, the 138

and 69 kV lines could remain in place, and 75 feet of additional ROW could be secured so that the new 500 kV line could be located at the outside edge of the existing ROW.

In addition to installing a new 500 kV line to replace the San Onofre-Serrano 220 kV line, Alternative 4 would terminate a number of SCE lines at Talega Substation. The San Onofre-Serrano 220 kV and San Onofre-Viejo-Chino 220 kV lines currently bypass Talega Substation. The Commonwealth study did not consider routing these lines to terminate in the substation, as is contemplated under Alternative 4. The reconfiguring of lines under Alternative 4 would result several lines terminating at Talega rather than San Onofre. The following changes would occur:

- The existing San Onofre-Serrano 220 kV line would be removed, and a single-circuit Talega-Serrano 500 kV line would be installed on new double-circuit towers between Serrano and Talega.
- The San Onofre-Viejo-Chino 220 kV line would be transferred to the new double-circuit 500 kV towers (and presumably the then-vacant 220 kV towers would be removed).
- The existing San Onofre-Viejo-Chino line would terminate at Talega and become a Talega-Viejo-Chino 220 kV line.
- Two existing San Onofre-Santiago 220 kV lines would terminate at Talega and become two Talega-Santiago 220 kV lines.
- Existing lines terminating at Talega are Talega-San Onofre (3), and Talega-Tap-Capistrano 230 kV lines.

Some changes have occurred in the ROW since the 2002 Commonwealth study. In March 2003, SCE submitted an application to the CPUC for the Viejo System Project (Application A.03-03-043), which the CPUC approved in July 2004 (Decision D.04-07-027), and construction was completed in March 2006. Under this project, SCE constructed the 220/66/12 kV Viejo Substation in Lake Forest and looped in the San Onofre-Chino 220 kV line, creating a San Onofre-Viejo-Chino circuit. A new 3.1-mile, 66 kV transmission line was built from Viejo Substation to Chiquita Substation. Existing double-circuit 66 kV poles were replaced by H-frame structures, and a third 66 kV circuit was added.

More recently, other changes have been proposed. In May 2012, SDG&E applied to the CPUC to implement the South Orange County Reliability Enhancement (SOCRE) Project (Application A.12-05-020). The project is under review by CPUC, and a draft EIR is expected to be published in early to mid-2014. Elements of the SOCRE Project would include:

1. Rebuilding and upgrading the existing 138/12 kV air-insulated Capistrano Substation (2 acres) as a 230/138/12 kV gas-insulated substation (6.4 acres) that will be named "San Juan Capistrano Substation."

2. Replacing a segment of a single-circuit 138 kV transmission line between the Talega and Capistrano substations with a new double-circuit 230 kV transmission line (7.5 miles), and relocating several transmission and distribution line segments (2 miles, combined) located near the two substations to accommodate the proposed 230 kV line.
3. Relocating a 12 kV distribution line into new and existing underground conduit and overhead on new structures from the proposed San Juan Capistrano Substation to Prima Deschecha Landfill (6 miles).

The transmission line components of the SOCRE Project would be located in the SDG&E ROW in San Juan Capistrano and San Clemente, as well as in unincorporated Orange and San Diego Counties. The SOCRE Project would change the mix of transmission lines in Segment E of the Serrano-Talega ROW corridor by replacing SDG&E's single-circuit 138 kV transmission line with a new double-circuit 230 kV line.

The following segments are common to Alternatives 2 or 3 and are described in those alternative descriptions in the sections "Alberhill to Suncrest" and "Enhanced TE/VS (Forest Route)," above:

- Case Springs to Talega and Inland: See Description for Alternative 3
- Inland to Escondido (230 kV): See Description for Alternative 3
- Warners Substation to Santa Ysabel Vicinity: See Description for Alternative 2
- Santa Ysabel Vicinity to Suncrest: See Description for Alternative 2
- Inland to Lilac to Warners: See Description for Alternative 3

#### **Alternative 4: Land Uses**

##### *Serrano to Talega*

The land-use description for this part of the Alternative uses the segment divisions used in the Commonwealth study.

**Segment A.** For 10 miles from Serrano Substation south to Baker Canyon Road, the ROW is in mountainous terrain in the Santa Ana Mountains. Leaving the substation, the ROW is on a ridge above suburban residential areas for roughly 1.3 miles. The nearest homes are along Eaton Court, where 28 residences are at the edge of the ROW on the north side. Crossing Serrano Avenue, the ROW passes on the south side of a multifamily apartment complex. From this point, much of the undeveloped land between Serrano Avenue and the Foothill Transportation Corridor toll road (in Segment B, below) is part of the historical Irvine Ranch. A large part of

this open space has been designated a Natural Landmark by both the State of California (2008) and the U.S. Department of the Interior (2006).

Designation as a national natural landmark is not a land withdrawal, does not change the ownership of an area, and does not dictate activity. Participation in this federal program is through voluntary agreements. (36 CFR 62) The Irvine Ranch contains a remarkably complete stratigraphic succession ranging in age from late Cretaceous (80 million years ago) to the present, which was a factor in its designation.

The ROW traverses the open landscape of the Weir Canyon Wilderness Area, crosses the Eastern Transportation Corridor toll road, and continues in the Fremont Canyon Wilderness Area. Just above Baker Canyon Road, the 500 kV Serrano Valley ROW separates from the Serrano-Talega ROW and heads east.

**Segment B.** Continuing south over Baker Canyon Road in open land, the ROW crosses Silverado Canyon Road, where an equestrian facility is on the east side of the ROW and a church on the west side.

Continuing south in open land, the ROW crosses over East Santiago Canyon Road into Limestone Canyon Regional Park and continues south. The route then enters Lake Forest and Whiting Ranch Wilderness Park. Crossing East Santiago Canyon Road again, the ROW passes through an area of low-density rural housing and agricultural uses. Five houses abut the east side of the ROW along Modjeska Grade Road. Crossing East Santiago Canyon Road again, the route continues south in open space between the residential communities of Portola Hills and Foothill Ranch. Between East Santiago Canyon Road and Glenn Ranch Road, the ROW is nearly 1,000 feet from homes in Portola Hills and 1,800 feet from homes in Foothill Ranch. The land on each side of the ROW is part of Orange County's Whiting Ranch Wilderness Park, with numerous trails crossing the ROW. South of Glen Ranch Road, several light industrial buildings and Viejo Substation are on the west side of the ROW. The east side of the ROW is parkland to the Foothill Transportation Corridor toll road.

**Segment C.** At this point, the ROW enters Mission Viejo and crosses over the toll road near El Toro Road and Marguerite Parkway. The ROW enters a densely developed area of multi- and single-family homes.

Several Mission Viejo parks have been developed on and adjacent to the ROW. In addition to park and recreation facilities, landscaping and trails have been developed in the ROW. In the vicinity of Escatron Road at Olympiad Road, the ROW passes into open space in Rancho Santa Margarita for a short distance before re-entering unincorporated Orange County near Las Flores. The ROW enters a canyon formed by Trabuco Creek. Homes are located more than 1,000 feet from the ROW on the uplands east and west of the canyon. The ROW enters the Ladera Ranch development just north of Crown Valley Parkway. Here the ROW is occupied by garden plots, a parking lot, and sports fields.

**Segment D.** Throughout Ladera Ranch, the ROW is heavily developed with trails and recreational facilities. Single- and multifamily homes are adjacent to either side of the ROW for

about 2.3 miles. The ROW then crosses open space and agricultural land, with low-density single-family housing to the west and agriculture to the east of the ROW. Crossing Ortega Highway (SR 74), the route passes through an equestrian facility and then follows the west side of Avenida La Pata. San Juan Hills High School is west of the alignment at Vista Montana.

**Segment E.** South of the high school, the ROW is in open space and crosses through a landfill at the end of Avenida La Pata. About 2 miles south of the high school, the route enters San Clemente, passing immediately west of a residential development and a golf driving range. On the west side of the ROW is the southern extension of Avenida La Pata. South of Avenida Pico, the ROW turns east toward the Talega Substation. To the north of the ROW is an area of office and light industrial development; to the south is the Bella Collinda Towne and Golf Club. The ROW continues through open land onto Camp Pendleton and into Talega Substation.

The following segments are shared with either Alternative 2 or Alternative 3, and described in the sections “Alberhill to Suncrest” and “Enhanced TE/VS (Forest Route),” above.

- Case Springs to Talega and Inland. See Alternative 3 (Enhanced TE/VS (Forest Route) above.
- Inland to Escondido. See Alternative 3 (Enhanced TE/VS (Forest Route) above.
- Inland to Escondido (230 kV). See Alternative 3 (Enhanced TE/VS (Forest Route) above.
- Inland to Lilac to Warners. See Alternative 3 (Enhanced TE/VS (Forest Route) above.
- Warners Substation to Santa Ysabel Vicinity. See Alternative 2 (Alberhill to Suncrest) above.
- Santa Ysabel Vicinity to Suncrest. See Alternative 2 (Alberhill to Suncrest) above.

## **Alternative 5: Imperial Valley to Inland**

Alternative 5 shown on Figures 13 (Option 1A) and 14 (Option 1B) on pages 67 and 68 includes two options:

- Option 1A is a 500 kV (AC) overhead transmission line from the Imperial Valley Substation to the proposed Inland Substation, with major components discussed below.
- Option 1B is an HVDC transmission line with the same endpoints, but with both overhead and underground segments.
- Both options would include reconductoring and the addition of a second circuit to the Escondido-Talega line, as well as loop-in to the new Inland Substation.

## Alternative 5, Option 1A: 500 kV Overhead

- New proposed 500 kV AC transmission line between the existing SDG&E Imperial Valley Substation and the new SDG&E Inland Substation. The overhead line would be about 145 miles in length.
- New 500/230 kV Inland Substation would be constructed at a new north location in northern San Diego County along the Talega-Escondido corridor.
- Upgrade/construction of a 500/230 kV substation at the existing Imperial Valley Substation.
- May include provisions for the installation of two 500 MVA +/- 45° phase shifters at the new SONGS Mesa 230 kV Substation (i.e., expanded existing Japanese Mesa Substation).

### *Overhead Route*

The route described below is that of the originally proposed Sunrise Powerlink transmission line. While this route presents many serious constraints, any other route from Imperial County to San Diego or Riverside County would also face these or similar constraints. This route is described because it presents challenges representative of any that would pass through ABDSP and northern San Diego County.

The 500 kV overhead transmission line would originate at the existing Imperial Valley Substation and parallel the existing 500 kV Southwest Powerlink (SWPL) and Sunrise Powerlink transmission lines for roughly 4 miles. The separation from the existing lines would be nearly 400 feet north of the existing Sunrise towers.

After 4 miles, the transmission line would turn north and travel through open desert land managed by the U.S. Bureau of Land Management (BLM) before crossing Interstate 8 (I-8) and continuing through open desert and private agricultural land west of the outskirts of the unincorporated town of Seeley. The line would continue north-northeast toward the existing Imperial Irrigation District (IID) 161 kV transmission line at the 20-mile mark.

Between 20.4 and 37.7 miles, the line would parallel the existing IID 161 kV transmission line to the east as it travels north-northwest toward the intersection of State Route (SR) 78 and SR 86. After this point, the line would diverge from the IID ROW to follow SR 78 for 2.5 miles. The segment of 500 kV overhead transmission line for the next 7 miles would continue due west along the south side of SR 78, turning due south and bypassing the existing IID Anza Substation to follow an existing IID 92 kV transmission line to the 50-mile mark.

At this point, the line would turn southwest for 1 mile crossing BLM parcels that are gifted lands (which sometimes carry use constraints), and then would turn due west to parallel the southern extent of an existing BLM property line. Then the line would be parallel to the existing IID 92 kV transmission line passing the existing IID San Felipe Substation at almost 59 miles.

The next segment would pass through ABDSP for nearly 23 miles (up to the 83-mile mark). The 500 kV transmission line would be constructed entirely overhead through the state park on lattice towers or H-frame structures. The existing 69 and 92 kV lines would need to be moved underground or reconfigured on the new towers.

At about 83 miles from the Imperial Valley Substation, the 500 kV line would leave the ABDSP. From the western boundary of ABDSP, the 500 kV line would continue northwest through Grapevine Canyon for 5 miles, to the point where it would cross County Highway S2. It would then follow the west side of County Highway S2 as it travels north toward Lake Henshaw, then west through Vista Irrigation District (VID) property. At MP 97.6, the route would diverge from the proposed Sunrise Powerlink route and would follow the route defined in the Sunrise Powerlink EIR/EIS as the “500 kV Full Loop.”

This route segment would cross Lake Henshaw, where it would join the route for Alternative 3, continuing along that route, as described in the section “Enhanced TE/VS (Forest Route)” above, to the Lilac Substation and then north to the Inland Substation.

#### **Alternative 5, Option 1B: HVDC Overhead/Underground**

- New HVDC transmission line between the existing SDG&E Imperial Valley Substation and the new SDG&E Inland Substation within northern San Diego County, overhead and underground line that would be about 145 miles long.
- New Inland Substation constructed in northern San Diego County along the Talega-Escondido corridor location.
- Installation of DC converter stations at the Inland and Imperial Valley Substations.

The route of this transmission line from the Imperial Valley Substation to the eastern edge of the ABDSP would be the same as that described in Alternative 5, Option 1A. However, in this case, the line would be an HVDC overhead transmission line, converting to underground and staying underground through the entire length of the ABDSP.

The line would transition from overhead to underground at the San Felipe Substation (at about 59 miles of overhead HVDC), about 2 miles east of ABDSP. The line would travel north in Split Mountain Road for 2.6 miles and then west in SR 78 for 8.2 miles to the intersection of SR 78/Old Kane Springs Road at MP 68.2. It would then travel nearly 13 miles underground in SR 78 to a point 1 mile east of the intersection with County Highway S2 (San Felipe Road) where it could stay underground in the highway, or could transition overhead for the crossing of the Earthquake Valley Fault.

The underground route would turn northwest in County Highway S2 for 3 miles, continue north adjacent to the east side of County Highway S2 (San Felipe Road) outside ABDSP for 8.8 additional miles, bypassing the Central East Substation area. The route would rejoin the route of Alternative 5, Option 1A, on S2 at MP 92.7 near Montezuma Valley Road (S22). The underground route segment is illustrated in Figure ES-13 of the final EIR/EIS for the Sunrise Powerlink Project.

This underground option would place the entire underground transmission line segment in paved roadways. This would avoid direct impacts to the state-designated Grapevine Mountains Wilderness Area and eliminate all long-term visual impacts along County Highway S2.

#### ***Underground Configuration***

As described in the Sunrise Powerlink EIR/EIS, an all-underground option through Anza-Borrego Desert State Park would be defined as follows:

“... two 230 kV underground circuits installed in separate concrete encased duct banks. Each duct bank would contain six 8-inch conduits and a 2-inch conduit for a communication cable. There would be two duct banks at the sides of the road, one for the Partial Underground 230 kV ABDSP SR78 to S2 Alternative and one for future circuits. SDG&E stated that it would prefer a 60-foot transmission easement for double-circuit underground 230 kV transmission lines; however, using a minimum distance of 6 feet combined with a duct bank spacing of 8 feet, results in a total minimum width of 20 feet that would be technically feasible to construct within the roadway. Sunrise Powerlink EIR/EIS Figure Ap.1-6 depicts an underground cross-section of the duct bank in a narrow road section (SR78 is as narrow as 23 feet wide in places). At vault locations, which are approximately 1,600 feet apart, 10 additional feet in width would be necessary; however, the vaults could be staggered to maintain the narrow width in tight places (road closure would still likely be required). The 230 kV vault dimensions would be 12 feet wide with a 10-foot height and a 26-foot length.”

Under this two-duct bank configuration (as opposed to one big duct bank in the middle of the roadway), traffic management would be easier and one duct bank could be built now and the second one could added at a future time. (California Public Utilities Commission/U.S. Bureau of Land Management, 2008)

With a DC underground line, rather than the double-circuit bundled 230 kV conductors described above, construction would be less disruptive by typically being in just one trench rather than two.

## Technical Feasibility Concerns

### *Fault Crossing*

The Earthquake Valley Fault, which is part of the Elsinore Fault Zone, runs up the San Felipe Valley and is parallel to County Route (CR) S2 for much of this route. The Earthquake Valley Fault has not been as well studied; however, the fault was zoned based on field surveys conducted by the California Geological Survey in 1979. To be Alquist-Priolo zoned,<sup>1</sup> a fault has to have had activity within last 11,000 years. This fault was zoned because the field mapping showed evidence of offset of young (Holocene aged) alluvial fans and stream channels and in places older granite rocks had been faulted over young alluvial deposits. Although no detailed trenching studies have been conducted on this fault to determine recurrence interval, slip rates,

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<sup>1</sup> The Alquist-Priolo Earthquake Fault Zoning (AP) Act was passed into law following the destructive February 9, 1971 Mw 6.6 San Fernando earthquake. The AP Act provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the AP Act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. See <http://www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx> for additional information.

or other characteristics, based on its length, estimated maximum earthquake offsets would likely be within the range of several feet.

There is some interaction between the Elsinore and Earthquake Valley Faults in the area, and they could both potentially rupture with a large earthquake on the Elsinore Fault. There is also speculation that some of the slip along the Julian segment of the Elsinore Fault is being transferred to the Earthquake Valley Fault, which could ultimately result in larger earthquakes on this fault. Due to a perpendicular fault crossing near the SR78/S2 intersection and the location of CR S2 parallel to the fault strands and crossing many fault traces up the San Felipe Valley, in the event of a large earthquake that included surface rupture in this specific area, multiple sections of duct bank could be damaged. Therefore, mitigation to improve recovery time for more than 10 miles of underground transmission line that crosses many fault strands would not be possible, even with offset of only a few feet.

The underground route segment would cross the Earthquake Valley Fault in Segment 1 and would parallel the fault for several miles in Segment 2 along CR S2. Major fault crossings are not generally recommended for high-voltage transmission lines due to the risk of rupture and time required for repair. However, due to the extremely high value of the open space in ABDSP and the San Felipe Valley, and the unknown frequency of major earthquakes in this area (likely substantially less frequent than once in 100 years), the underground line is considered to be feasible and a worthwhile tradeoff for elimination of impacts.

### *Construction Challenges*

Construction along CR S2 would likely be feasible, but SR 78 is narrow (as narrow as 23 feet in width) and windy with rocky slopes on both sides of the roadway, which would make construction challenging and costly in this portion. A hazard analysis before the start of construction would be required to evaluate the risk of falling rock due to vibration from construction equipment.

The hazard analysis would identify the hazard and would propose solutions to reduce or eliminate the risk of falling rocks.

In several areas, such as east of the bridge on SR 78 and east of San Felipe Road, the roadway is adjacent to steep, rocky slopes. To construct an underground line through such areas or with trenching below the roadway, blasting of rock slopes may be necessary, which is more challenging and has greater ground disturbance, but is still considered to be technically feasible.

### *Regulatory Feasibility*

There are several regulatory feasibility issues including:

- **California Department of Parks and Recreation.** Equipment and materials lay-down areas would be required for construction. A total of five to six of such areas along the route will be required, with each area being roughly 5 acres. These lay-down areas would be distributed at regular intervals along the routes. This would require anywhere from two to three lay-down areas within ABDSP. These areas will be fenced and either graveled

or watered for dust control. Upon completion of the underground construction, the lay-down areas would be returned to their preconstruction conditions, to the extent feasible. Mitigation measures and restoration techniques for the potentially significant impacts to the ABDSP, and notably to designated state wilderness and designated critical habitat, would be subject to approval of the ABDSP and the appropriate resource agencies. Construction of the overhead portion of this alternative would be within the state-designated Grapevine Mountain Wilderness Area. However, in order for this to occur, the State Parks Commission would have to reverse the wilderness designation of roughly 1 mile of wilderness area, which would require a state park plan amendment and, thus, could create regulatory infeasibilities that could delay the in-service date.

- **California Department of Transportation.** In the narrow roadway areas bordered by steep rock cuts on one side and down slopes on the other side, there is limited work space for equipment. For example, front-end loaders with outriggers need room to lift up rock or other excavated material, turn, and load the material into waiting dump trucks within a given work radius. The limited work space afforded by the narrow roadway would require different and slower operations than what are normally used and would require road closures and detours during these operations, which would need to be approved by Caltrans.

In addition, the underground route crosses an existing bridge on SR 78. The bridge appears structurally sound and capable of supporting the conduit and cable loads. However, approval from Caltrans for bridge attachments would be required. In addition, rock excavation is anticipated near bridge entrances and exits from underground duct bank to headwall of the bridge, which may pose some risks to the bridge's structural integrity.

- **San Felipe Hills Wilderness Study Area.** The alternative route would pass adjacent to the San Felipe Hills Wilderness Study Area (WSA) west of ABDSP and along CR S2. In Section 603(a) of the Federal Land Management Policy Act (FLMPA) of 1976, Congress directed BLM to identify potential wilderness areas in lands under its jurisdiction. The areas were to have characteristics of wilderness as defined in the Wilderness Act of 1964, of which the San Felipe Hills was one such area. However, the California BLM presented its suitability recommendations to Congress in the Eastern San Diego County Management Framework Plan (1981), in which BLM recommended that San Felipe Hills be removed from consideration as a wilderness area. As Congress has not yet made a determination as to whether San Felipe Hills will be removed from consideration, the area shall be managed according to the direction provided in Section 603(c) of the FLMPA (commonly called the "Interim Management Policy for Lands Under Wilderness Review"). Generally, this directive requires BLM to maintain the characteristics of wilderness so that the suitability of the WSA for preservation as a wilderness area is not impaired. However, as the line would be west of and outside the WSA, there would be no regulatory feasible issues.

- **San Felipe Valley Wildlife Area.** The San Felipe Valley Wildlife Area is a 6,690-acre habitat preserve/wildlife area acquired by the CDFG Wildlife Conservation Board through Proposition 70 (Wildlife and Natural Areas Conservation Program of 1988), Proposition 117 (Habitat Conservation Fund/Mountain Lion Initiative) and from Proposition 12 (Parks Bond Act of 2000). Consultation would be required with CDFG to cross this area along County Highway S2, but it would likely be feasible.

#### **Alternative 5: Land Uses**

Both options of Alternative 5 would cross a combination of private land and BLM land within Imperial County. From the point where the route turns westward along SR 78, the land ownership is a checkerboard pattern of BLM land, private land, and Caltrans mitigation land. Upon entering ABDSP the two route options would be essentially parallel, but with the underground (DC) route in the highway and the overhead route adjacent to the highway. Leaving the ABDSP at its western boundary, the overhead route passes the BLM-managed San Felipe Hills Wilderness Study Area, then onto private land to the Warners Substation. At this point, the route joins the route described for Alternative 3 (Warners Substation to Lilac, Lilac to Inland).

#### **Alternative 6: Valley to Inland**

Alternative 6 shown on Figure 15, page 69 has two options:

- Alternative 6, Option 2A is a 500 kV (AC) overhead transmission line from the Valley Substation to the proposed Inland Substation.
- Alternative 6, Option 2B is an all-underground HVDC transmission line with the same endpoints.

Both options would include reconductoring and the addition of second circuit to the Escondido-Talega line, as well as loop-in to the new Inland Substation.

#### ***Alternative 6, Option 2A (500 kV Overhead)***

##### ***Option 2A, Route Description***

The suggested route would cross agriculture lands for the first 1.7 miles in unincorporated Riverside County. The route would turn south for 2 miles along the eastern border of Menifee in unincorporated Riverside County. The route would turn southeast for 1 mile, due east for 3 miles, then due south for 3 miles, west of the Diamond Valley Lake. The route would turn southeast for 3.75 miles then east southeast for 3.75 miles crossing north of Skinner Reservoir. The route would turn southward for 4.7 miles then west for 1.5 miles. The route would turn southwest for 2.5 miles then west southwest for 6.7 miles, crossing through Temecula. The route would then turn south southwest for 3.24 miles paralleling the I-15 freeway. Once into San Diego County, the route would head due east for 2.1 miles to reach the proposed Inland Substation, avoiding the Pechanga Reservation and the Agua Tibia Wilderness Area.

##### ***Option 2A, Land Uses***

The new corridor would cross agricultural lands for the first 1.7 miles in unincorporated Riverside County, crossing Case Road. The nearest homes would be located along the northern

border of Menifee, nearly 800 feet from the corridor on the southern side of Case Road. There is sufficient land available in this portion of the corridor to locate a line farther from existing homes.

After turning southward, the corridor would follow the eastern border of Menifee for 2 miles in unincorporated Riverside County, crossing existing agricultural fields and a seasonally dry canal. The nearest homes would be located along the eastern border of Menifee about 750 feet from the corridor, on the west side of Briggs Road. There is sufficient land available to the east to locate the line farther from existing homes.

After the route turns westward, it would cross existing agriculture and open space in Riverside County until reaching Diamond Valley Lake. The nearest homes would be several rural residences located more than 500 feet from the route. Due to existing homes on both sides of the corridor, there would be limited flexibility to move the ROW farther from these homes.

The corridor would turn south at Diamond Valley Lake, a reservoir managed by the Metropolitan Water District (MWD). It would parallel the San Diego Aqueducts managed by the San Diego County Water Authority. In this region the corridor would cross open space in the Southwestern Riverside County Multi-Species Reserve (RCHCA 2009). The Multi-Species Reserve is a protected area for native species including horned lizards, mountain lions, Stephens' kangaroo rat, Southwestern willow flycatcher, and Quino checkerspot butterfly (Riverside County Parks 2010). It encompasses nearly 14,000 acres between Diamond Valley Lake and Lake Skinner. Much of this area is not open to the public.

Near the intersection of Rawson Road, the route would turn southeast to avoid a rural neighborhood and the Skinner Reservoir, also managed by the MWD. It would continue cross-country over rolling hills, north of Lake Skinner. The route would cross some scattered rural homes, but the majority of this portion would traverse the Multi-Species Reserve, including crossing a small portion of Riverside County Habitat Conservation Agency land. The nearest home would be roughly 260 feet from the corridor, but there is some flexibility in the route to move farther from homes.

About 4 miles east of the Skinner Reservoir, the route would turn south for 4.7 miles, remaining east of the unincorporated communities in the greater Temecula area. The route would be as close as 200 feet from scattered rural houses and existing agricultural operations in this area. To avoid existing homes, the route would take a series of jogs westward then eastward while generally maintaining a southerly route.

North of Vail Lake, the route would run southwest for an estimated 7.8 miles. The first 4.3 miles of this portion of the corridor cross rolling hills, west of Vail Lake, and avoid the rural homes that are located throughout the unincorporated greater Temecula area. The route then crosses back into a rural residential and agricultural area for 2.15 miles. Homes would be nearly 500 feet from the corridor, which would remain primarily on existing agriculture lands. Shortly before the intersection with State Route 79, the corridor would follow the Temecula Creek Trail to avoid impacting homes until crossing into Temecula city limits. Upon entering Temecula, the

route would follow the Temecula Creek bike path to avoid taking homes. The bike path runs southwest crossing several existing parks, including the Redhawk Dog Park and Pala Community Park. The route would be less than 100 feet from residential development on both sides of the corridor.

At the intersection of the Temecula Creek and the Pechanga Parkway, the route would turn south, running through the Temecula Creek Inn Golf Course and within 200 feet of the Temecula Creek Inn.

After crossing the inn, the route would remain parallel to Interstate 15 and adjacent to the Old U.S. Highway 395. This area is primarily industrial and commercial, including RV and boat storage yards.

Near the community of Rainbow along Valley Boulevard West, the route would turn due east and parallel the existing Talega-Escondido 230 kV corridor, over open space until reaching the proposed Inland Substation. The corridor would be located nearly 200 feet south of the Rainbow Conservation Camp. The Rainbow Conservation Camp is an all-female camp jointly operated by the California Department of Corrections and Rehabilitation and the Department of Forestry and Fire Protection (CAL FIRE) that provides inmate fire crews for fire suppression principally in San Diego and Riverside Counties (CDCR 2013).

#### *Alternative 6, Option 2B (HVDC Underground)*

##### *Option 2B, Route Description*

To minimize traffic delays caused by underground line construction, routes avoiding heavily traveled roadways are preferable. The suggested route is defined as follows:

- Exit the Valley Substation and follow Case Road southeast for 1.3 miles.
- Turn south following Brigg Road for a little more than 1 mile before turning east on Simpson Road for 1 mile.
- Turn south on Leon Road and follow the road for 8.2 miles.
- At Benton Road, the route would jog southeast along Benton Road to Van Gaale Lane then Auld Road, before turning south-southwest on Pourroy Road for 2.2 miles.
- At Murrieta Hot Springs Road the route would turn west for about 0.8 mile before turning south along Butterfield Stage Road to Walcott Lane and back to Butterfield Stage Road for 4.8 miles.
- At De Portola Road, the route would turn west for 2.6 miles until reaching Jedediah Smith Road where the route would turn south briefly before continuing west on State

Route 79 for 0.4 mile, then southeast on Pechanga Parkway for 0.2 mile to Rainbow Canyon Road.

- The route would follow Rainbow Canyon Road for 3.4 miles until shortly after it becomes Rainbow Valley Boulevard. Near the intersection of Rainbow Valley Boulevard and Rainbow Valley Boulevard West, the route would transition from underground to overhead and would continue west for 2 miles until reaching the proposed Inland Substation location.

### ***Option 2B: Land Uses***

When exiting the Valley Substation, the underground corridor would follow Case Road. Case Road is a dirt road adjacent to the former Burlington Northern Santa Fe (BNSF) railroad tracks that extend northwest-southeast. There is a roughly 130-foot ROW for the railroad tracks and road. This railroad corridor is part of the future vision of the Transit Coalition for a future extension of the Perris Valley Line Metrolink into Hemet and the Twin Cities (Murrieta/Temecula); however, no plans for this line are currently available (Transit Coalition, 2013).<sup>2</sup>

The route would turn south on Brigg Road. Where the route would be located on Brigg Road is primarily a dirt road roughly 40 to 50 feet wide. Brigg Road becomes paved where it is adjacent to existing suburban homes within Menifee. The corridor would turn east on Simpson Road, a paved two-lane road, that is 30-feet wide with a 15-foot buffer on the southern side of the road. It would be surrounded by existing agricultural fields and water ponds. The route would turn south on Leon Road, a roughly 30- to 40-feet-wide, two-lane road that is both paved and dirt road in some areas. It is surrounded primarily by agricultural lands with some rural homes and smaller portion of suburban houses. In the suburban portions of the road, near Temecula, the road right-of-way widens to 70 feet. At the intersection of Leon Road and Lantana Way, Leon Road splits into two roads, a paved road that turns southwest and an unpaved road that continued south. The HVDC corridor would follow the unpaved road that is roughly 30-feet wide until reaching Benton Road.

The route turns east at Benton Road, where the road is two lanes with a 30-foot-wide right-of-way. Shortly before reaching Van Gaale Lane, Benton Road widens to a 100-foot-wide road with two lanes in either direction and is adjacent to houses on either side. The underground corridor would follow Van Gaale Lane, a two-lane, 30-foot-wide right-of-way. Agricultural lands border Van Gaale Lane to the west, and suburban homes border it to the east. The underground corridor turns east on Auld Road where the road is two lanes with a 30-foot right-of-way. Once Auld Road enters into a more suburban area, the road widens to two lanes in either direction and a 70-foot right-of-way. Similarly, Pourroy Road is also a two-lane 30-foot road that widens into a four-lane, 70-foot right-of-way near suburban areas.

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2. <http://thetransitcoalition.us/nationaltc/>

The route follows Pourroy Road to Murrieta Hot Springs Road then Butterfield Stage Road, both of which are four-lane, divided roads with 80-foot rights-of-way. They are surrounded by suburban residential development or planned development. The HVDC route would turn onto Walcott Lane, a two-lane road on a 30-foot right-of-way, and would cross rural residential areas then cross into suburban residential lands. The route would return to Butterfield Stage Road, a combination of a two-lane, 30-foot right-of-way road that would become a four-lane road with a 70-foot right-of-way. Butterfield Stage Road would remain four lanes surrounded by suburban homes for the majority of this portion. Similarly, DePortola Road would begin as a four-lane, 70-foot right-of-way road and become a smaller two-lane road near the intersection with Jedediah Smith Road, also a two-lane road. In this area larger houses are located on either side of De Portola and Jedediah Roads. State Road 79 has three lanes in each direction and a 115-foot-wide right-of-way. The route would be adjacent to commercial and agricultural lands.

From State Road 79, the corridor would turn onto Pechanga Parkway, which also has three lanes in each direction before turning onto Rainbow Valley Boulevard. Rainbow Valley Boulevard is a two-lane road with a 40-foot right-of way that runs through a suburban residential development, the Temecula Creek Inn Golf Course, and then open space. The route would transition to overhead near an industrial use area surrounded by open space. As with the Valley Inland Powerlink Alternative 2A, the route would turn east and head cross-country until reaching the proposed Inland Substation.

## References

California Public Utilities Commission/U.S. Bureau of Land Management, October 2008, *Final EIR/EIS for Sunrise Powerlink Project*.

Transit Coalition website,  
<[http://www.thetransitcoalition.us/a\\_better\\_inland\\_empire/talk\\_20121009.html](http://www.thetransitcoalition.us/a_better_inland_empire/talk_20121009.html)>, accessed December 15, 2013.

# **APPENDIX B**

## **Electric and Magnetic Fields**

## **APPENDIX B:**

# **Electric and Magnetic Fields From HVDC Transmission Lines and Potential Health Concerns**

One of the considerations in planning or siting of new high-voltage direct current (HVDC) electric transmission lines is the public interest and concern regarding potential health effects from exposure to electric and magnetic fields (EMFs).

Although HVDC and high-voltage alternating current (HVAC) transmission lines are similar in many ways, there are specific differences in the EMF associated with each. The following discussion focuses on the electrical environment near HVDC transmission lines and on research related to public health concerns. This appendix highlights important differences between HVDC and HVAC lines where this is relevant to making a distinction related to potential health effects.

There are three primary electrical parameters associated with the environment around HVDC transmission lines: (1) the electric field, (2) the magnetic field, and (3) air ions.

### **Electric Fields**

Similar to HVAC lines, an HVDC line will generate an electric field surrounding the conductors, with the magnitude of the electric field dependent on the voltage of the HVDC line. There are naturally occurring electric fields in the atmosphere and in the home or office, as experienced when walking across carpet.

The strength of the static electric field from an overhead HVDC line decreases rapidly with distance from the source. Humans perceive static electric fields such as produced by HVDC lines at about 25 kV/meter. Electric fields from both overhead HVDC and HVAC lines are shielded by trees, walls, or other objects and, if shielded, do not penetrate the body.

A distinction for the electric field from HVDC lines is that unlike an alternating current line, the electric field for a direct current line is a static electric field that does not change polarity over time. Since HVDC electric fields are not time-varying, they do not induce notable electric fields within the body as may be the case for electric fields from HVAC lines. Due to this difference, the results from studies or research related to time-varying electric fields from HVAC lines may not be relevant or applicable to HVDC lines.

Substantially fewer studies have been conducted related to electric fields emitted by undersea power cables and any possible environmental impact to marine organisms. However, marine fish and invertebrates are able to detect some electromagnetic fields. Electric fields are detected by elasmobranchs (sharks, skates, and rays), sturgeons, and lampreys; these fields are used by these fishes to detect prey, find mates, and perhaps for orientation. For buried cables the electric field would be effectively zero, and for direct lay subsea cables, the strength of the electric field

falls rapidly with increasing distance from the cable. The area where these fields would be detected by marine organisms is only in close proximity to the cable. There is limited evidence of specific effects of EMF on fish and other marine organisms.

Adverse health effects from electric fields of the type and magnitude generated by HVDC transmission lines have not been scientifically established. As transmission line electric fields may be shielded by most materials, exposure is primarily transient and experienced only when in open areas in the immediate vicinity of the line.

## **Magnetic Field**

Again, similar to HVAC lines, an HVDC line will generate a magnetic field surrounding the conductors, with the magnitude of the magnetic field dependent on the current flowing in the HVDC line. Unlike electric fields, magnetic fields from both HVDC and HVAC lines are not shielded by trees, walls, or most other objects. A key difference for the magnetic field from HVDC lines is that, unlike an alternating current line, the magnetic field for a direct current line is a static field that does not change over time. The magnetic field from HVDC lines is much like the Earth's magnetic field that varies from 700 milliGauss (mG) near the poles to 200 mG near the equator. The strength of the magnetic field beneath an overhead line may be similar to the strength of the Earth's static magnetic field but drops off rapidly when not near the line. At the edge of the right-of-way for an overhead line or a meter above ground for a buried HVDC line, the magnetic field strength may be roughly 10 percent of the Earth's magnetic field.

Static magnetic fields have been studied extensively at strengths significantly higher than for HVDC transmission lines due to their use in medical diagnostics, such as magnetic resonance imaging (MRI). Occupational studies focused on workers near devices with strong magnetic fields found no significant increase or decrease in the prevalence of the diseases evaluated. The number of epidemiological studies carried out is small, and the data do not allow a conclusion that exposure to DC magnetic fields affects health. While it is not possible to demonstrate the absence of any health effect under all circumstances, from current scientific knowledge there are no indications that exposure to static magnetic fields of the type generated by HVDC lines will adversely affect human health.

Magnetic fields emitted by undersea power cables may be detected by salmonids, rockfishes, halibuts, and others for navigation, homing, and orientation. Generally, conclusions surrounding the human health impacts of EMF also apply to potential impacts on marine species. Substantially fewer studies have been conducted related to EMF emitted by undersea power cables and any possible environmental impact to marine organisms.

## **Air Ions**

The third phenomenon associated with overhead HVDC transmission lines are air ions or charged air molecules produced by corona. Corona is the partial electrical breakdown of the air surrounding conductors when the electric field at the surface of the conductor becomes large enough to dislodge electrons from air molecules within two to three centimeters of the conductor. A result of corona is both positive air ions that have lost an electron and negative air

ions that have picked up the excess electrons. Air ions that have the opposite polarity to that of the conductor are drawn to it and neutralized. Since the voltage on HVAC lines changes polarity 60 times a second, both positive and negative air ions are substantially neutralized. For HVDC lines this is not the case. The air ions with the same polarity of the conductor migrate toward the opposite pole of the HVDC circuit. However, a significant portion of the air ions migrate to the ground and away from the transmission line. Movement of these air ions is influenced by the electric field of the HVDC line and by wind.

Air ions are naturally present in the atmosphere, and the density can be altered by both man-made and natural phenomena. Background air ion densities range from 1,000 ions per cubic centimeter in open areas to 80,000 ions per cubic centimeter in urban areas. Directly below HVDC transmission lines, air ion densities are in the range of 100,000 ions per centimeter. At the edge of the right-of-way for a HVDC transmission line, the air ion density is reduced, as a result of dispersion and mixing.

Air ions have been studied for more than a hundred years for the impact on biological systems, with much of this research focused on possible therapeutic benefits. This research has included both animal and human subjects and has not provided any reliable evidence that air ions produce any harmful effects.

# **APPENDIX C:**

## **Right-of-Way Requirements**

The onshore alternatives considered in this report include the following technologies:

- 500 kV alternating current (AC) lines, overhead
- High-voltage direct current (HVDC) line, overhead
- HVDC line, underground

The following sections address overhead and underground construction separately. In the section addressing underground transmission, a summary of 500 kV underground technologies is presented as background for readers. However, the alternatives presented in Section 3 of the report do not include any 500 kV underground segments.

## Overhead Towers

To evaluate the feasibility of each type of transmission line, the right-of-way (ROW) requirements for each must be defined. For both AC and DC options, the ROW width that would be acquired for permanent access rights is generally 150 to 250 feet. Despite the difference in structure widths, the width of ROW required is defined by the potential sway of conductors and the requirement to maintain clearance between conductors and vegetation within and adjacent to the ROW.

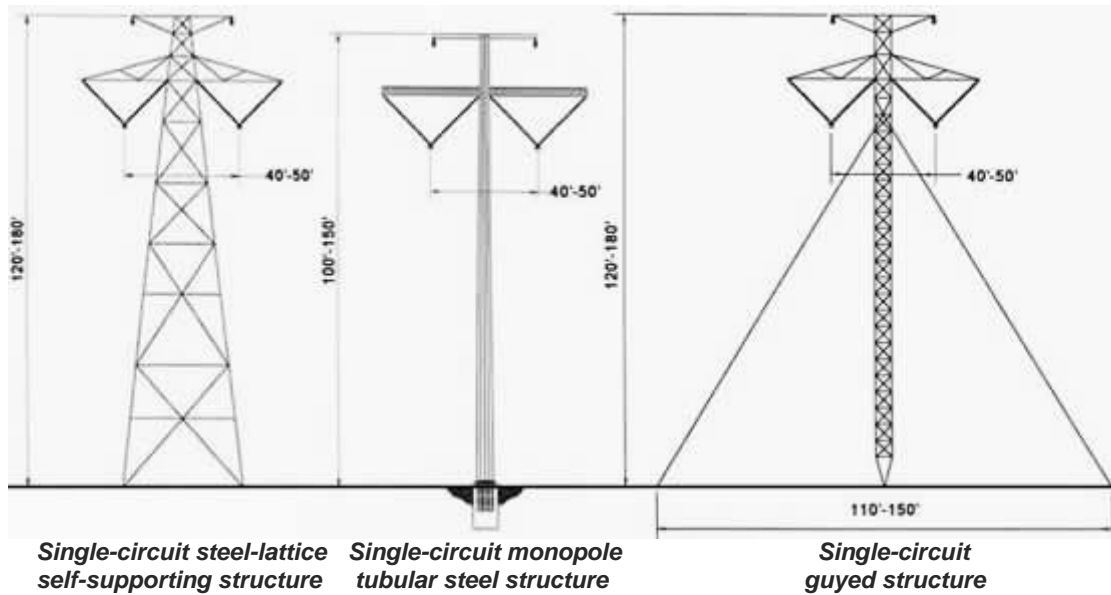
Table C-1 defines these requirements, and Figure C-1 illustrates the options.

**Table C-1: Comparison of High-Voltage Tower ROW Requirements (feet)**

Tower Type	Tower Height	Span Between Structures	Structure Width at Top	Structure Width at Base
500 kV Lattice	130–170	1000–1700	105	40
500 kV Tubular Steel Pole	140–170	1300	65	15–20
HVDC Lattice	120–180	900–1500	80–90	30–40
HVDC Monopole	100–150	900–1500	80–90	15
HVDC Guyed	120–180	900–1500	80–90	150 ft for guy wire separation

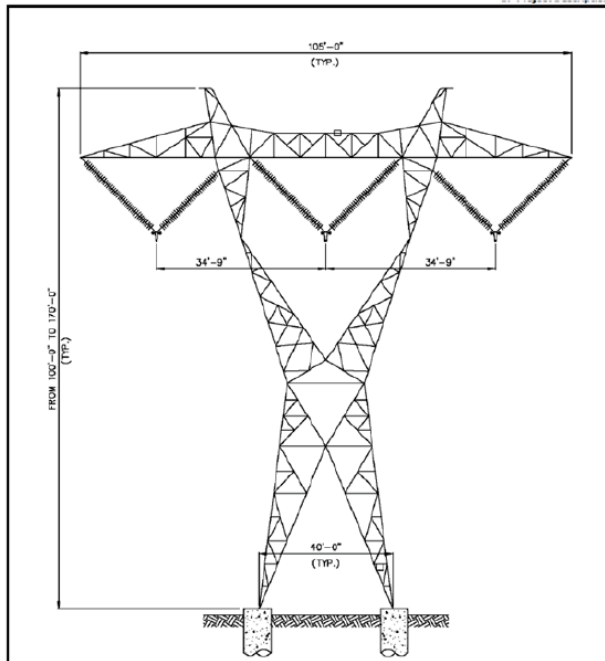
Source: TransWest Express, 2013 and California Public Utilities Commission, 2008

**Figure C-1: 500 kV and HVDC Tower Types**



Source: Trans West Express

**Typical HVDC Tower Types**

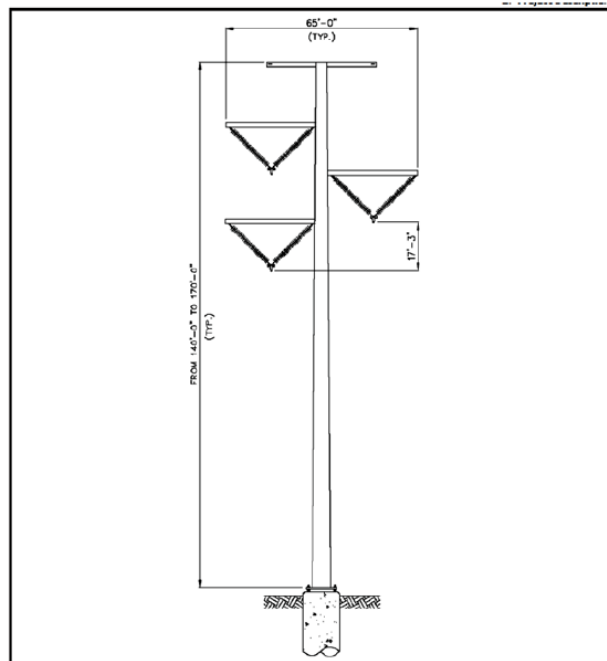


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Environmental Group

Note: Dimensions are approximate and may vary with site conditions.

Source: PEA 2006

**Sunrise Powerlink Project**  
Figure B-13  
Typical 500 kV  
Single Circuit Lattice Tower:  
Imperial Valley and Central Links



**Aspen**  
Environmental Group

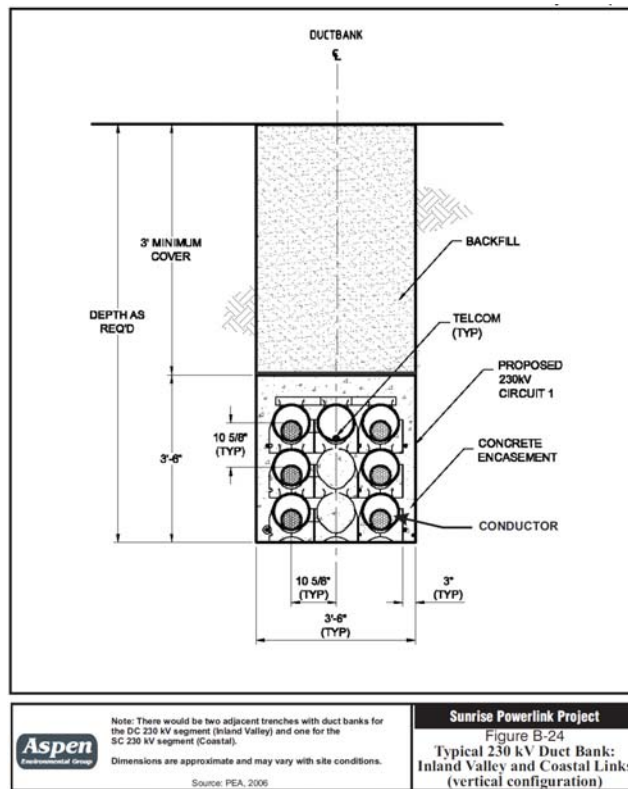
Note: Dimensions are approximate and may vary with site conditions.

Source: PEA 2006

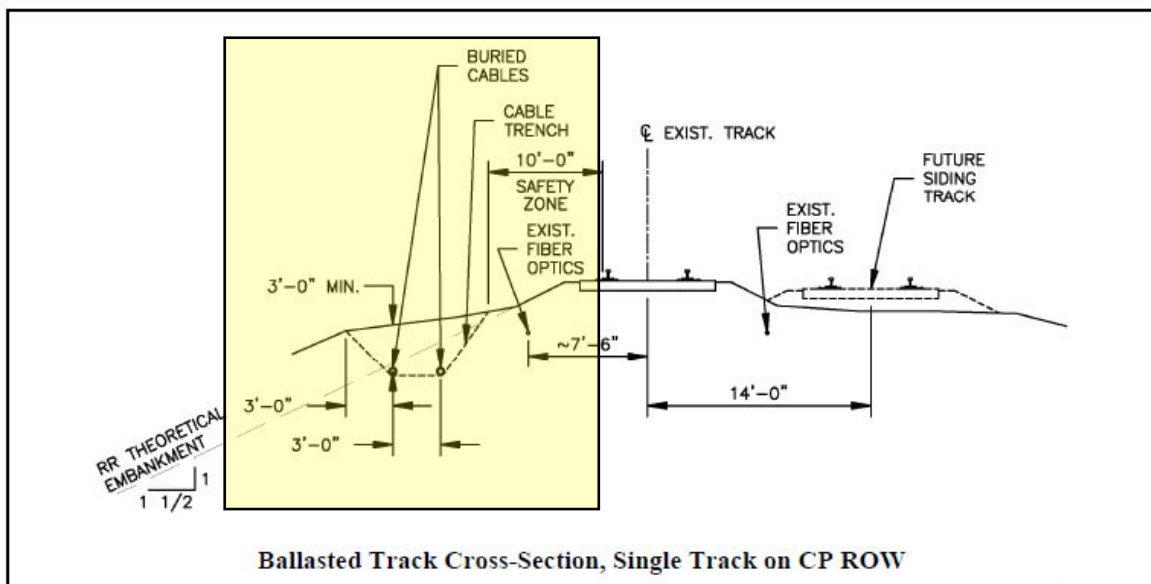
**Sunrise Powerlink Project**  
Figure B-14  
Typical 500 kV Single Circuit  
Tubular Steel Pole:  
Imperial Valley Link

Source: California Public Utilities Commission, 2008

**Figure C-2: Configuration of AC Underground Systems**



### 230 kV Double Circuit



### HVDC Underground (yellow portion shows relevant trench information; remainder illustrates railroad ROW installation)

Source: California Public Utilities Commission, 2008

## Underground Construction Requirements

The most significant advantage of DC transmission is the ability to easily transition to underground and to minimize the size of the trench and underground facilities. Table C-2 and Figure C-2 present a comparison among underground transmission construction options, using three examples:

- Champlain Hudson Power Express: a proposed underground and underwater HVDC line
- Sunrise Powerlink: 230 kV underground segment
- Tehachapi Renewable Transmission Project (TRTP, 500 kV underground segment, Chino Hills)

Table C-2: Comparison of Underground High-Voltage Transmission Requirements			
Voltage and Description	Trench Width	Phase Separation	Duct Bank Dimensions
HVDC	2 feet at bottom; 6-9 feet at top	1 foot separation	No duct; 2 cables laid side by side in trench
230 kV (bundled conductors; two sets of duct banks for max capacity)	3 to 6 feet wide	10-12 inches; in duct bank	3.5 x 3.5 feet
500 kV	8 feet	5 feet	Splice vaults: 45 x 12 x 15

Source: TransWest Express, 2013 and California Public Utilities Commission, 2008

### Chino Hills 500 kV Underground Construction

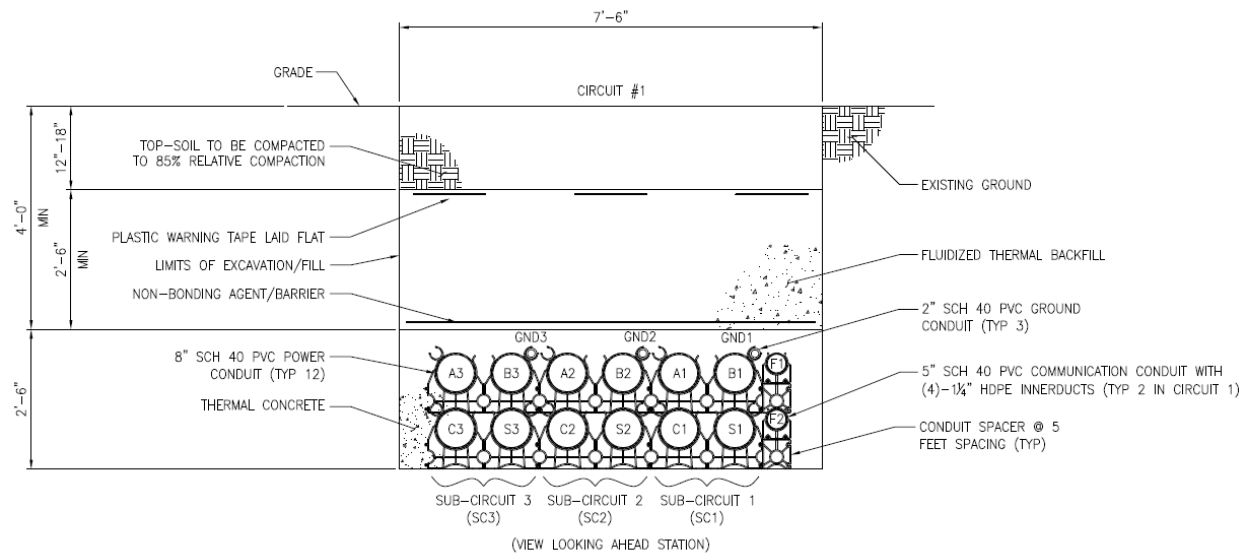
The CPUC recently ordered SCE to construct a 3.5-mile segment of the 500 kV Tehachapi Renewable Transmission Project underground through a residential area in the city of Chino Hills. The existing ROW was 150-foot wide and previously held a 220 kV overhead transmission line. SCE's previously approved project required installation of a double-circuit 500 kV line in the same corridor. The towers were constructed before the CPUC decision, so the current construction activity requires removal of the new towers and construction of a large duct bank along the length of the underground segment.

The trench for the main duct bank will be 8-feet wide, and the duct bank will require a 4-foot cover. However, based on the varying topography, the trench will be deeper in many places because the system is rigid. The other major components required for the 500 kV underground segment, each requiring major excavation efforts, are:

- Cable splice vaults: 45 ft (L) x 12 ft (W) x 15 ft (D)
- Restraint vaults: 12 ft (L) x 15 ft (W) x 15 ft (D)

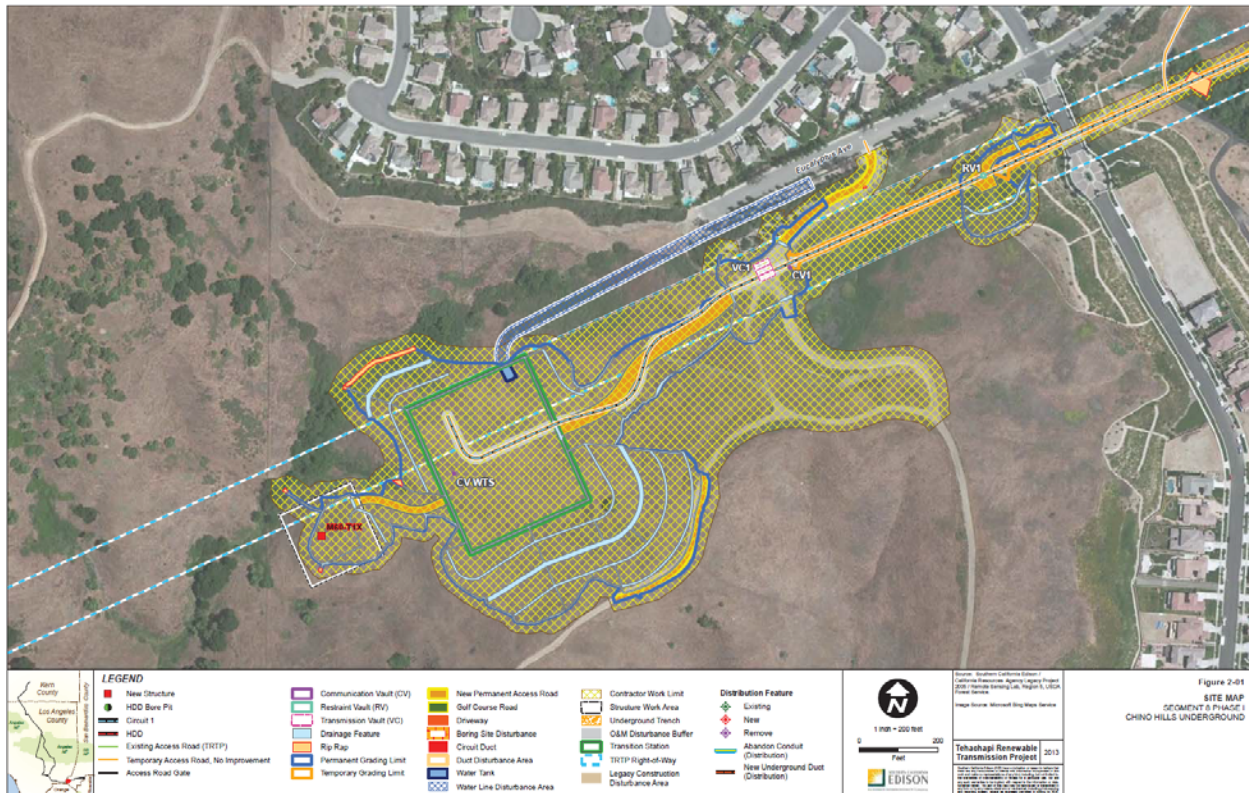
See Figure C-3 for a view of the Chino Hills underground project.

**Figure C-3: Components of Chino Hills 500 kV Underground System  
Duct Bank Configuration for 500 kV Conductors**



Source: California Public Utilities Commission, 2013

**Figure C-4: Grading and Construction Required for Overhead/Underground Transition Station**



Source: California Public Utilities Commission, 2009

## References

California Public Utilities Commission, 2009, Southern California Edison's Tehachapi Renewable Transmission Project (Application [A.07-06-031](#), filed June 29, 2007) *Addendum to the October 2009 Final EIR*, [http://ftp.cpuc.ca.gov/gopher-data/environ/tehachapi\\_renewables/EnvironmentalReview\\_ALL.pdf](http://ftp.cpuc.ca.gov/gopher-data/environ/tehachapi_renewables/EnvironmentalReview_ALL.pdf).

California Public Utilities Commission and U.S. Department of Interior Bureau of Land Management, *Final Environmental Impact Report/Environmental Impact Statement and Proposed Land Use Amendment: San Diego Gas & Electric Company Application for the Sunrise Powerlink Project SCH #2006091071DOI Control No. FES-08-54*, October 2008, <http://www.cpuc.ca.gov/environment/info/asp/sunrise/toc-feir.htm>.

TransWest Express, LLC, 2013, < <http://www.transwestexpress.net/about/maps.shtml>>



# **APPENDIX D:**

## **California Department of Transportation's Policies**

# **California Department of Transportation Project Development Procedures Manual, Chapter 17 – Encroachment in Caltrans' Right of Way**

## **Article 1 – Definition**

### *Encroachment*

An encroachment, as defined in Section 660 of the Streets and Highways Code, can be any tower, pole, pole line, pipe, pipe line, fence, billboard, stand or building, or any structure or object of any kind or character which is within the right of way but not a part of the Caltrans facility.

## **Article 2 – Utility Encroachment Policy**

### *New Utility Longitudinal Encroachments*

With the exception of special cases permitted under strictly controlled conditions, new utilities will be permitted to be installed longitudinally within the access control lines of any freeway or expressway—including installations on structures that cross major valleys or rivers and installations through tunnels. Utilities will not be allowed to be installed longitudinally within the median area. Utilities that transport hazardous materials will not be allowed in a vehicular tunnel under any circumstances.

These provisions were established to provide for the maximum degree of safety and to preserve the traffic-carrying capacity, both of which are warranted by the large public fund investment in freeways. Exceptions can be made at locations where circumstances make it impossible or unreasonably costly to locate utilities outside of the access controlled right of way. To the extent feasible and practicable, any utility installations allowed within access controlled rights of way should be located so that they can be serviced and maintained from outside the right of way.

### *Exceptions*

#### **Justification for Exceptions**

Where such longitudinal installations are requested, the utility owner must assure Caltrans of all of the following:

- That the accommodation will not adversely affect highway safety and traffic operations
- That alternate locations are not available or cannot be implemented at a reasonable cost, from the standpoint of providing efficient utility services in a manner conducive to safety, durability, and economy of maintenance and operations...

## Article 6 – Procedures for Requesting an Exception to Caltrans' Encroachment Policy

### *District Recommendation*

No encroachment proposals should be submitted without district recommendation, as indicated by the signatures of the District Division Chiefs for Right of Way, Maintenance, Operations, and Design. In those instances where an applicant with an encroachment proposal refuses to accept the district's denial of application, the district should contact the DLP Manager, Attention: Encroachment Exceptions.

It is standard practice to process all applications from written requests. If an applicant or district personnel want to make a personal appearance at the HG encroachment meeting, prior approval should be obtained from the DLP Manager.

### Encroachment Permits Manual 300 – Exceptions to Policy

#### *302 Encroachments within any Highway Right of Way (Rev 08/02)*

Requests for the following encroachments shall be submitted by districts to the Headquarters Division of Design, Program Manager:

1. Facilities that limit use of the right of way and/or may add to Caltrans' costs in future construction.
2. Changes in facilities approved previously by the Headquarters Division of Design, Program Manager, when the proposed changes alter the conditions under which the original encroachment was approved.
3. Any grading, removal of cut material or placement of fill material within any right of way.
4. Encroachments associated with toll road demonstration projects.
5. Placing utility facilities within the median area of any State highway.
6. Allowing utilities to remain in an existing tunnel or tube that is incorporated into a new highway improvement.
7. Exceptions or changes to the standards described in Chapter 6.
8. Exceptions to high and low risk policies.
9. Drainage diversions.
10. Groundwater disposal.
11. Longitudinal private pipelines carrying gas, oil, or other flammable fluids that are operated under franchises with local agencies.

### *303 Encroachments within Freeway and Expressway Rights of Way*

The Headquarters Division of Design, Program Manager is authorized by the Director, Department of Transportation to make determinations and rule on all matters regarding installation of encroachments on freeways and expressways. Matters concerning encroachments on conventional highways are delegated to the districts except as indicated under Section 302.

Specific requests for the following encroachments are submitted by the district to Headquarters Division of Design, Program Manager:

1. Encroachments requiring maintenance within the access control lines of freeways and expressways. This includes those installations created by rearrangement of existing facilities and those requested by utility owners or others under encroachment permit.
2. Longitudinal encroachments within the access control lines of freeways and expressways and on bridges other than highway overcrossing structures. Included are those longitudinal encroachments created by rearrangement of existing facilities, and those requested by utility owners under encroachment permits, including fiber optics facilities.
3. Encroachments requiring temporary or permanent access to or from through traffic lanes on freeways and expressways.
4. Encroachments involving installation of locked gates in freeway and expressway fences for other than Caltrans' use (see the Highway Design Manual).
5. Temporary use of controlled access right of way by private individuals or developers for grading.
6. Utility facilities that cross freeways should be as normal as possible to the freeway centerline. Facilities that are skewed greater than thirty degrees (30°) from the normal must have DLP approval as a longitudinal encroachment.
7. Longitudinal encroachments within a conventional highway that is upgraded to a freeway and remain within the access control lines, the utility facilities will normally be relocated outside the access control. When compelling reasons require such facilities to remain within the access control, the District must submit a request for exception to this policy, for each facility, to the Headquarters Division of Design, Program Manager.

A Policy on the Accommodation of Utilities within Freeway Right-of-Way (American Association of State Highway and Transportation Officials, October 2005)

*New Utility Installations Along a Freeway*

Installation of new utilities shall not be permitted longitudinally within the control of access lines of any freeway, except that in special cases such installations may be permitted under strictly controlled conditions.

Where such longitudinal installations are requested, the utility shall in each case show to the transportation agency's satisfaction that all the following conditions are met:

- The accommodation will not adversely affect the safety, design, construction, traffic operations, maintenance, or stability of the freeway.
- Alternate locations are not available or are cost prohibitive, from the standpoint of providing efficient utility services.
- It will not interfere with or impair the present use or future expansion of the freeway.
- The location of the utility outside of the right-of-way would result in the loss of productive agricultural land, or loss of productivity of agricultural land, if any. In this case, the utility must provide information on the direct and indirect environmental and economic effects, which will be evaluated and considered by the transportation agency pursuant to Title 23, U.S. Code Section 109(I)(1).
- The accommodation satisfies the conditions of Section 7.

All longitudinal utility accommodations as may be warranted herein shall only be in accordance with an approved permit issued by the transportation agency.

Installation of utilities shall not be allowed longitudinally within the median area.

Where longitudinal utility installations must traverse interchange areas, they shall be located and treated in the same manner as utility crossings within interchange areas, as in Section 5.

Service connections to adjacent properties shall not be permitted from longitudinal utility installations located within the access control lines of freeway.



# **APPENDIX E:**

## **Submarine Detailed Corridor Maps**

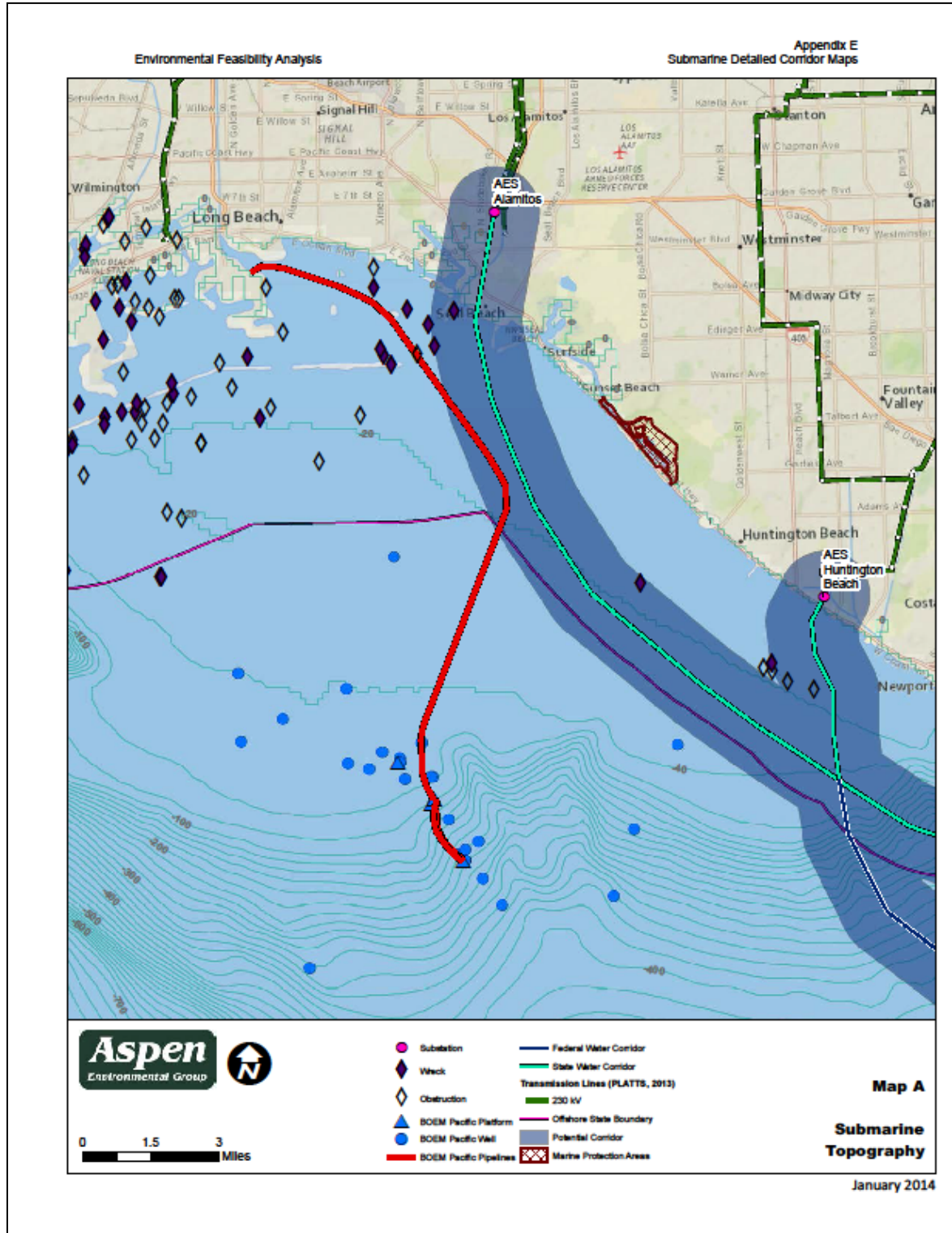
This appendix contains six higher-resolution sub-maps for each of the following figures showing the submarine transmission route alternatives introduced in Section 6 of this report:

Figures E-1 through E-6 (pages E-3 through E-8): Show the underwater topography along the submarine corridors

Figures E-7 through E-12 (pages E-9 through E-14): Show the slopes of the topography

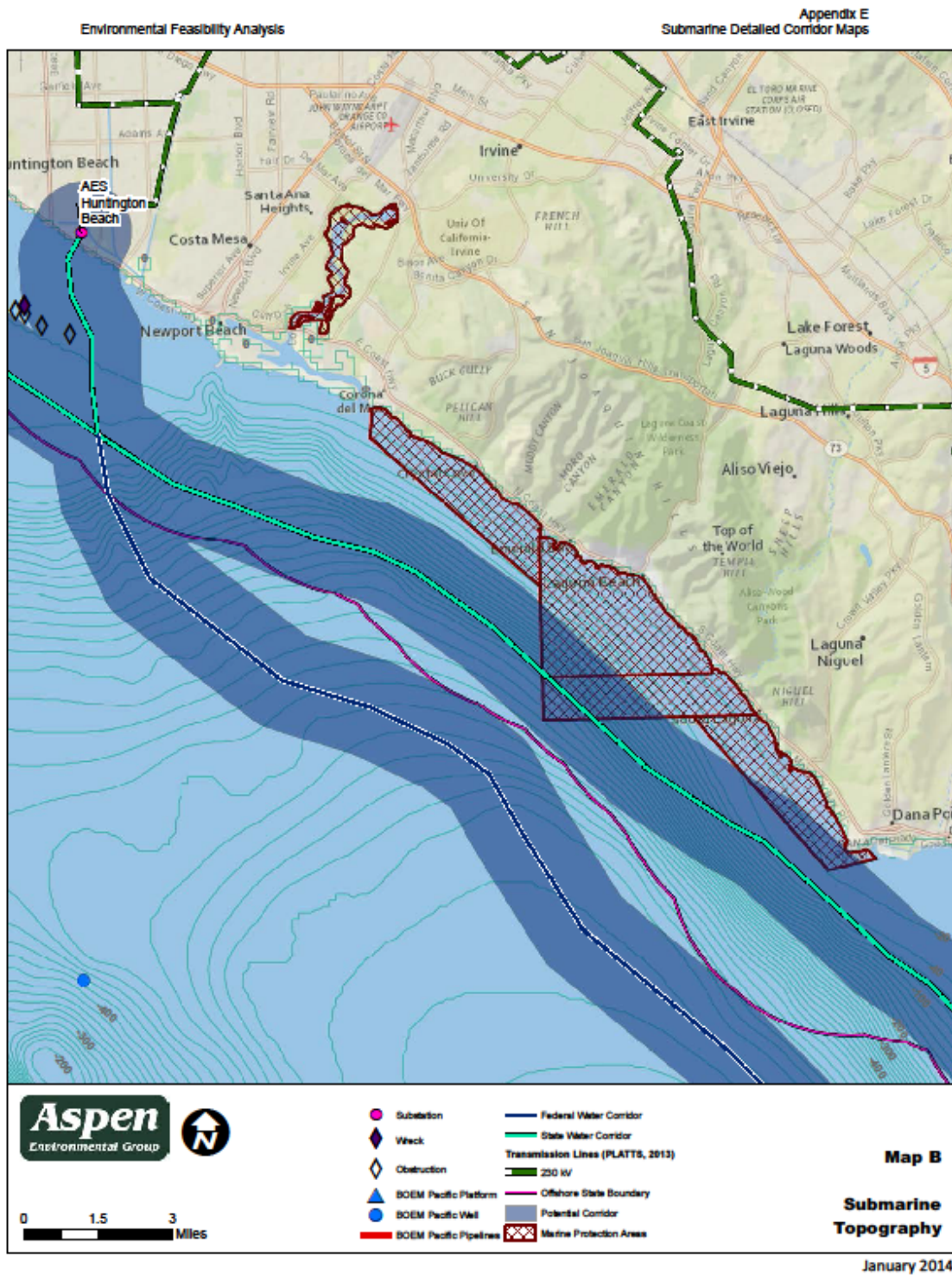
Figures E-13 through E-18 (pages E-15 through E-20): Show known faults in the study area.

Figure E-1  
Submarine Topography



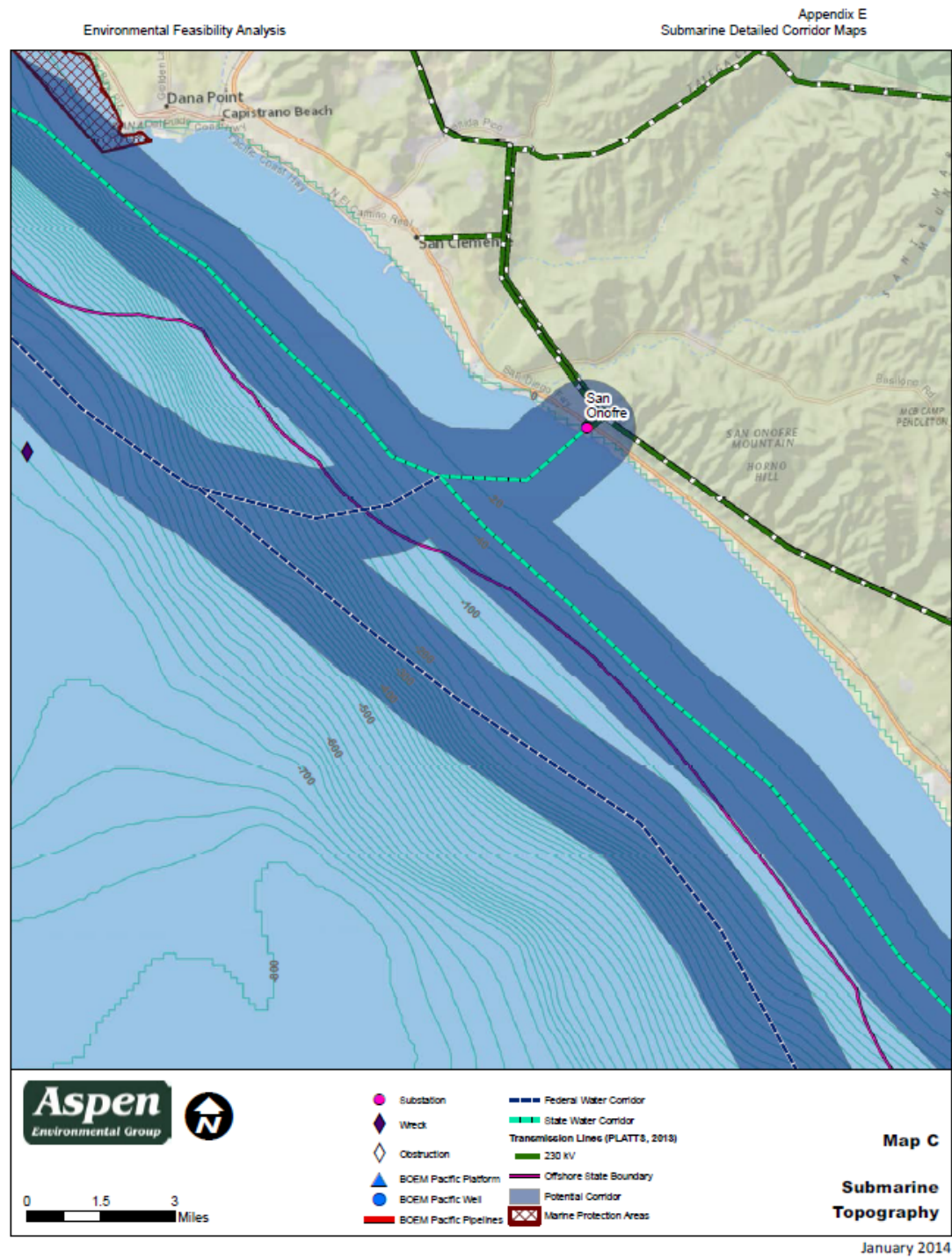
Source: Aspen Environmental 2014

## Map E-2 Submarine Topography



Source: Aspen Environmental 2014

## Map E-3 Submarine Topography

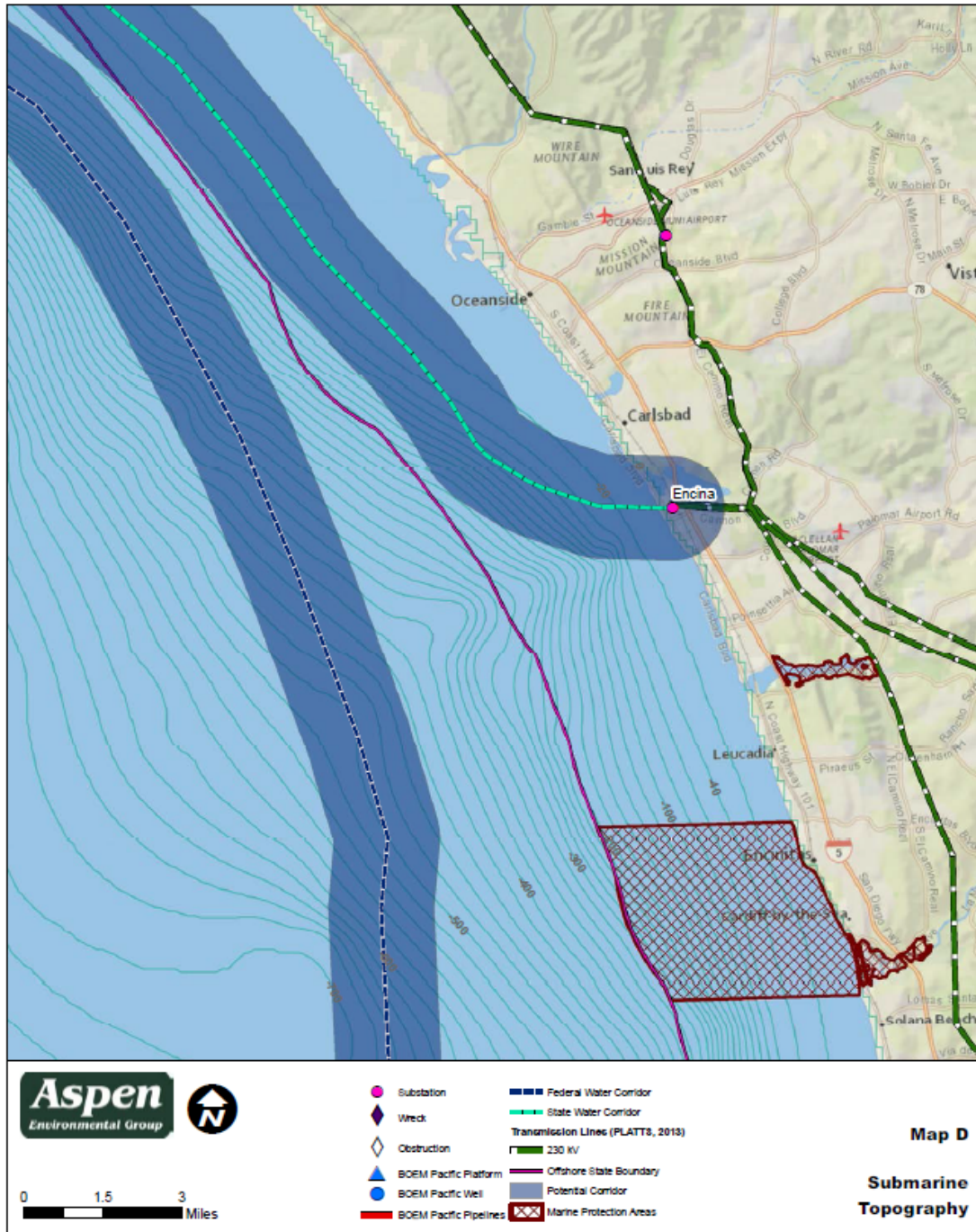


Source: Aspen Environmental 2014

## Map E-4 Submarine Topography

Environmental Feasibility Analysis

Appendix E  
Submarine Detailed Corridor Maps



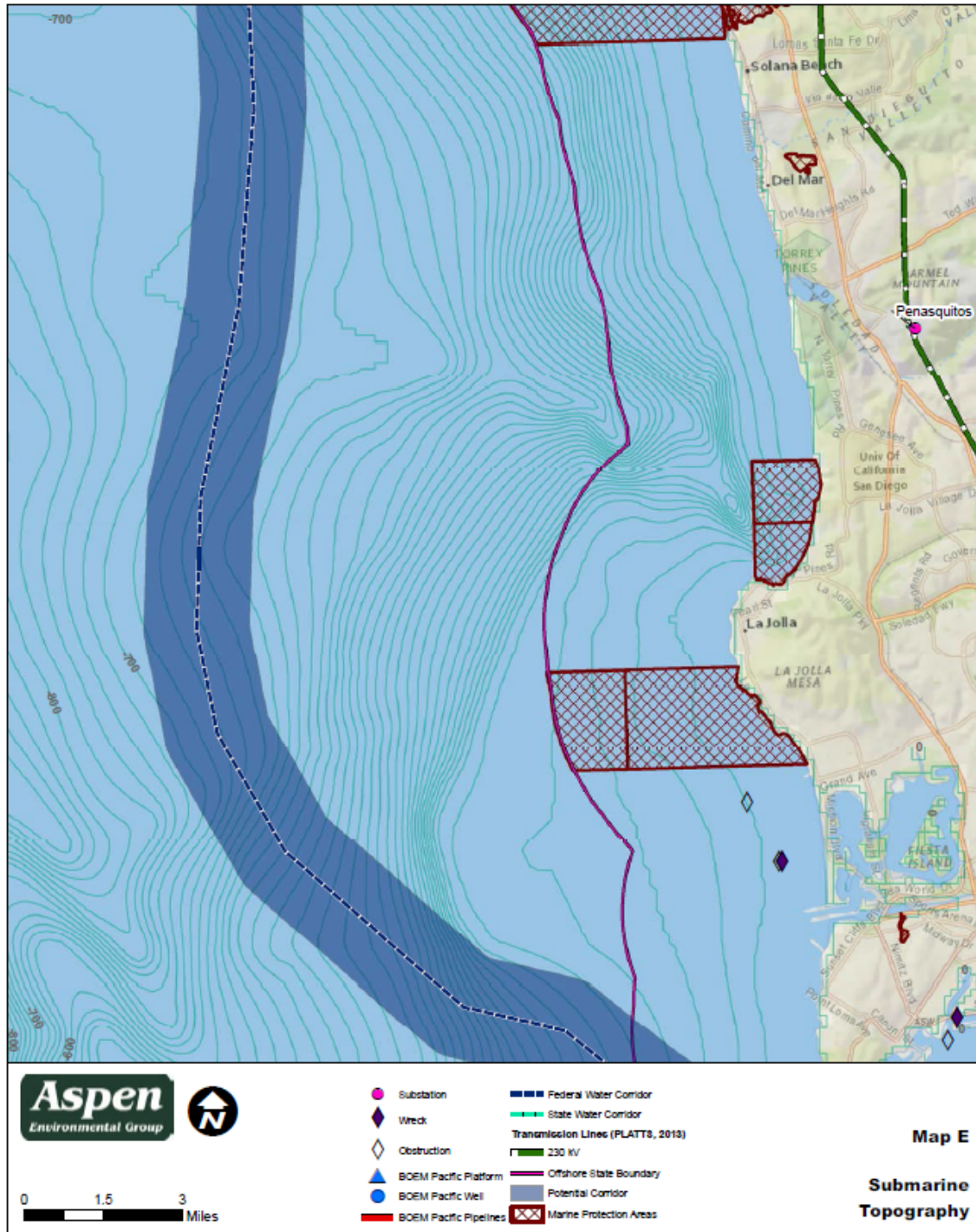
January 2014

Source: Aspen Environmental 2014

## Map E-5 Submarine Topography

Environmental Feasibility Analysis

Appendix E  
Submarine Detailed Corridor Maps

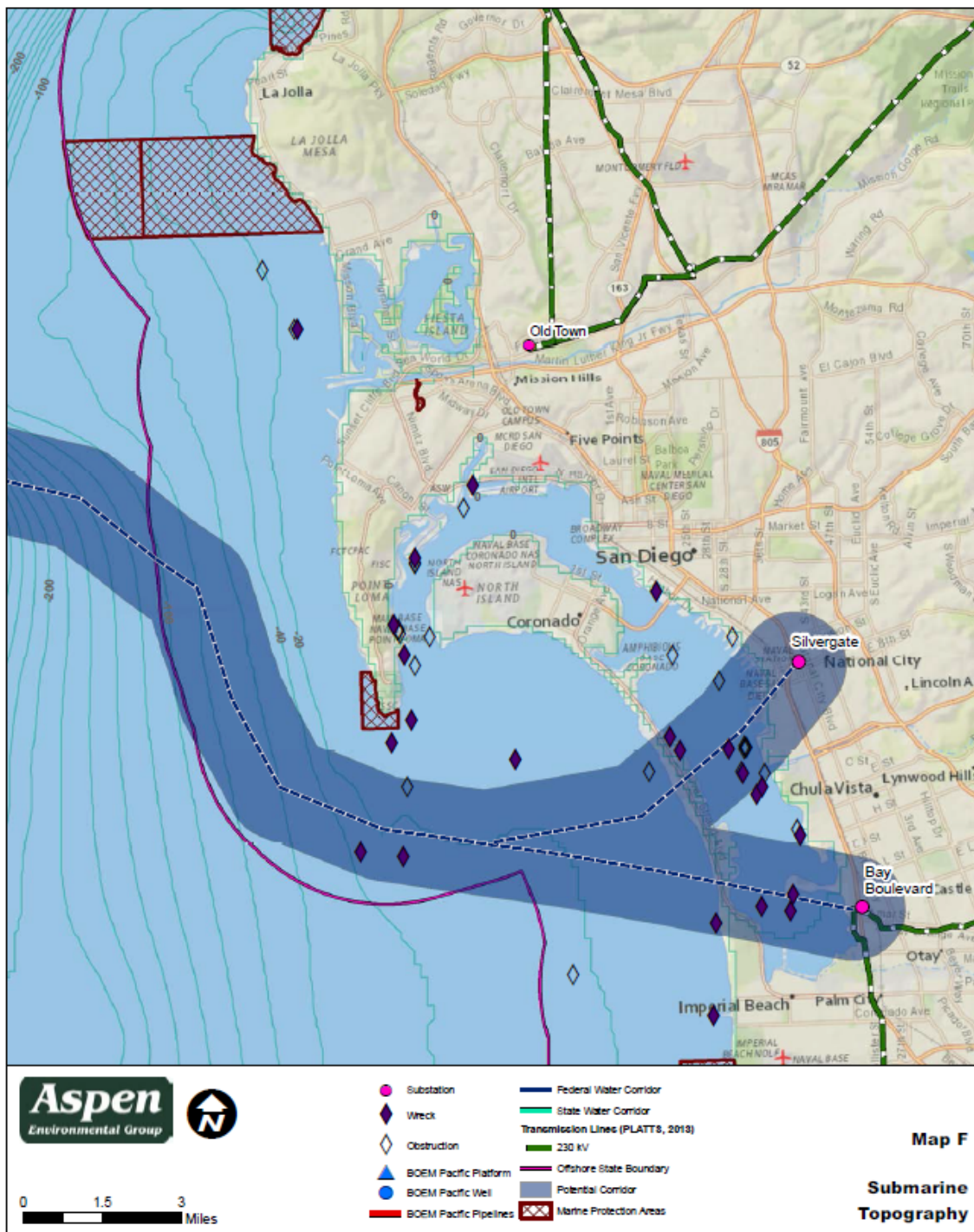


Source: Aspen Environmental 2014

## Map E-6 Submarine Topography

Environmental Feasibility Analysis

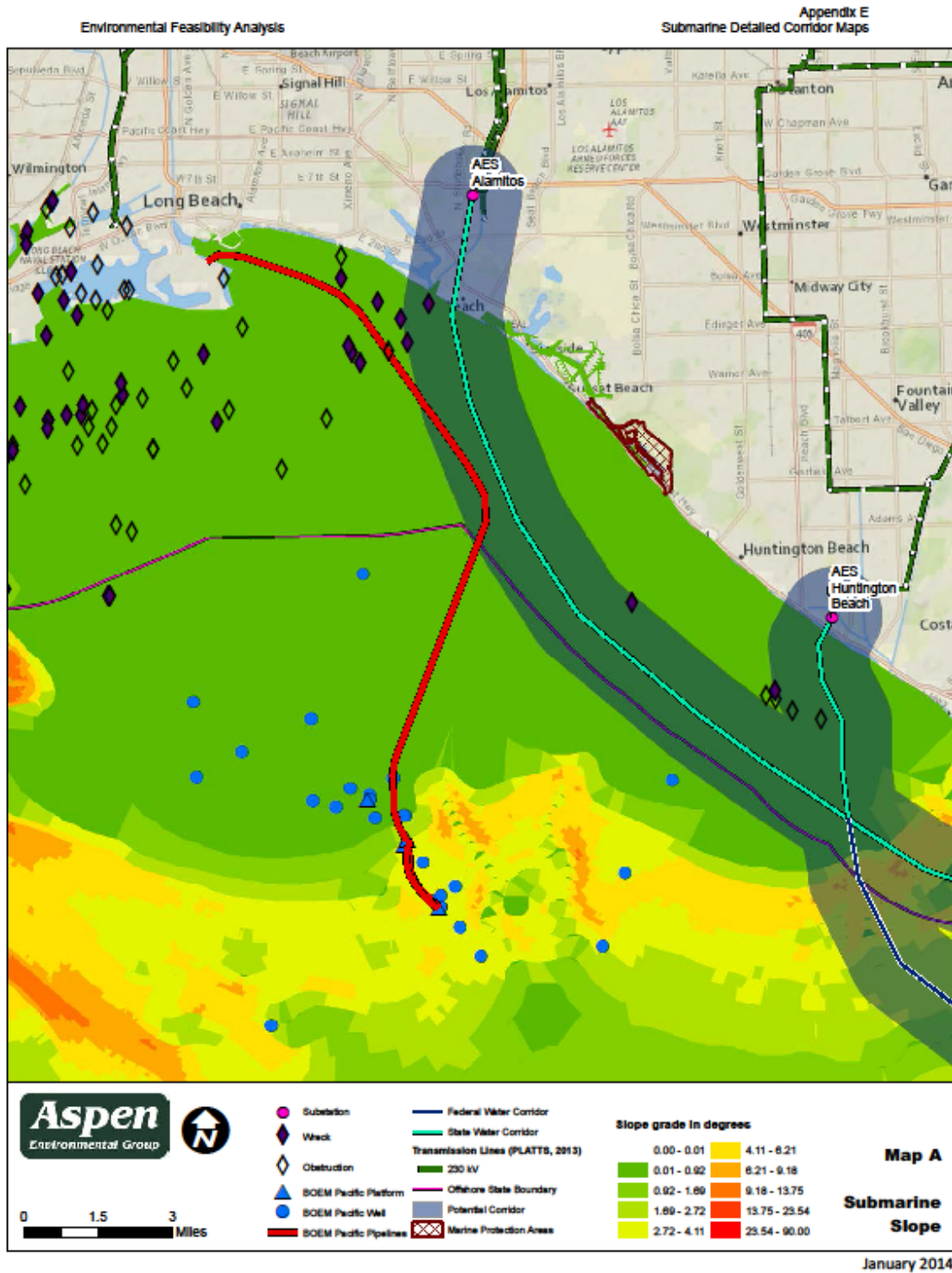
Appendix E  
Submarine Detailed Corridor Maps



January 2014

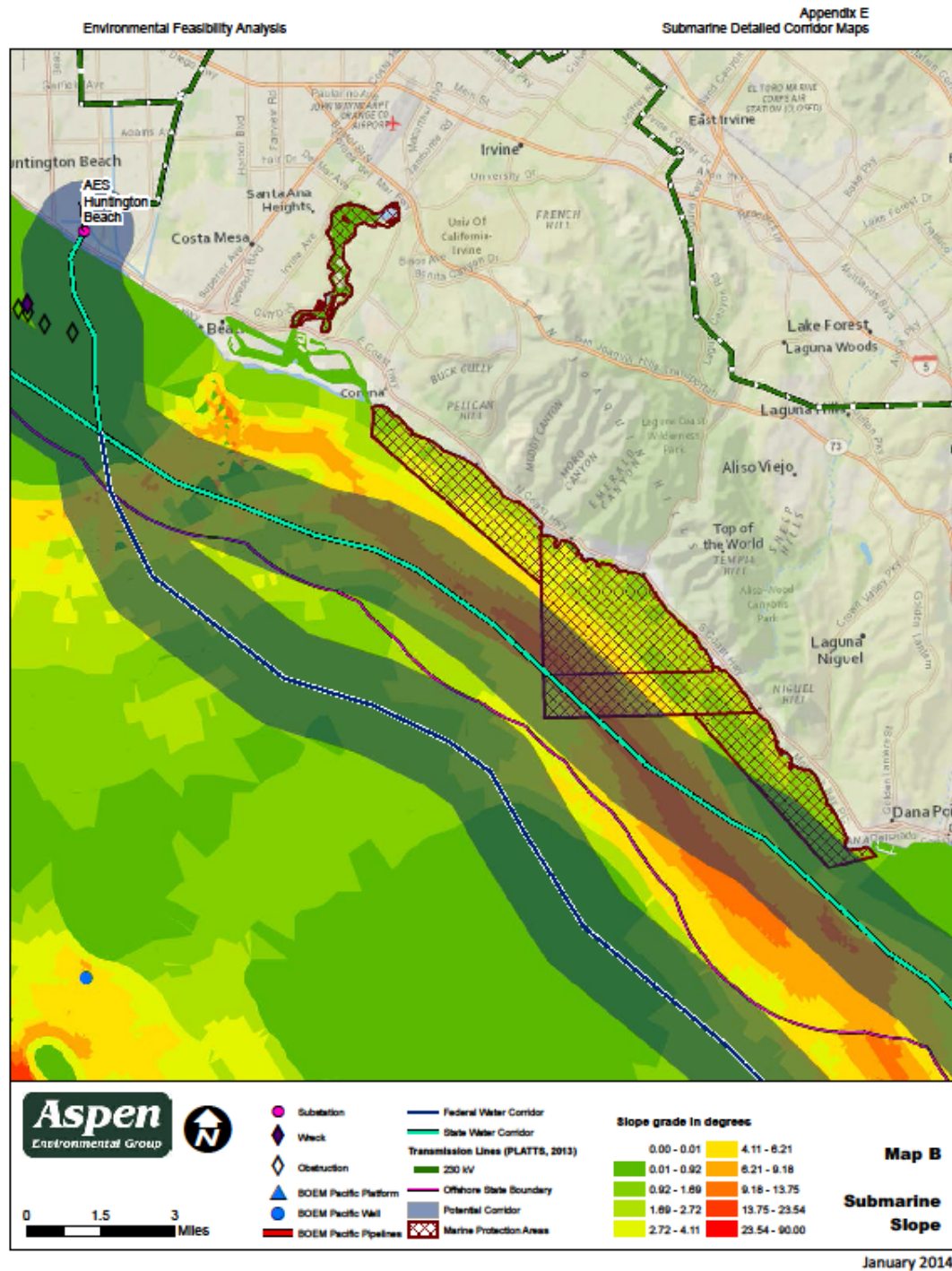
Source: Aspen Environmental 2014

## Map E-7 Submarine Slope



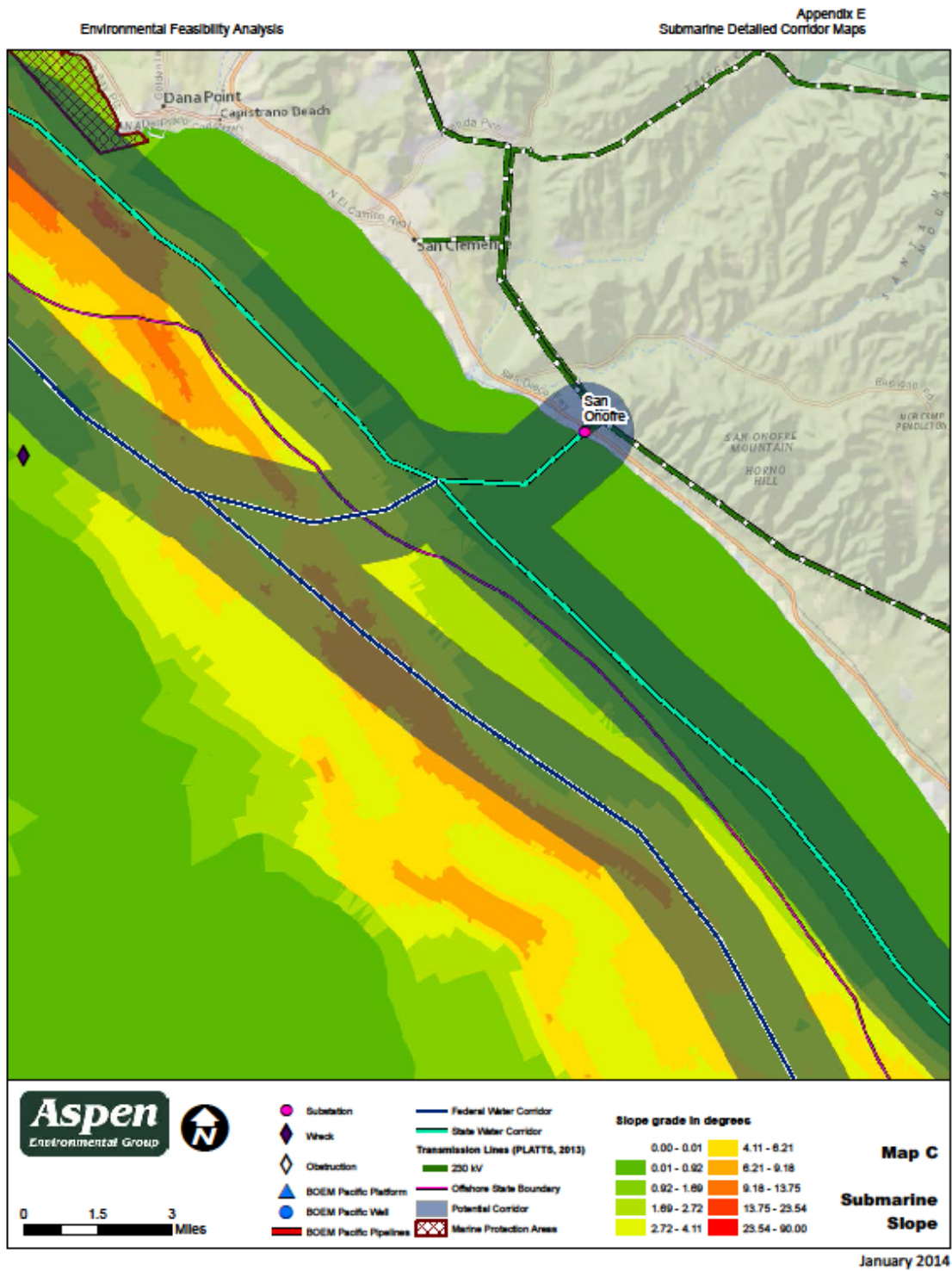
Source: Aspen Environmental 2014

## Map E-8 Submarine Slope



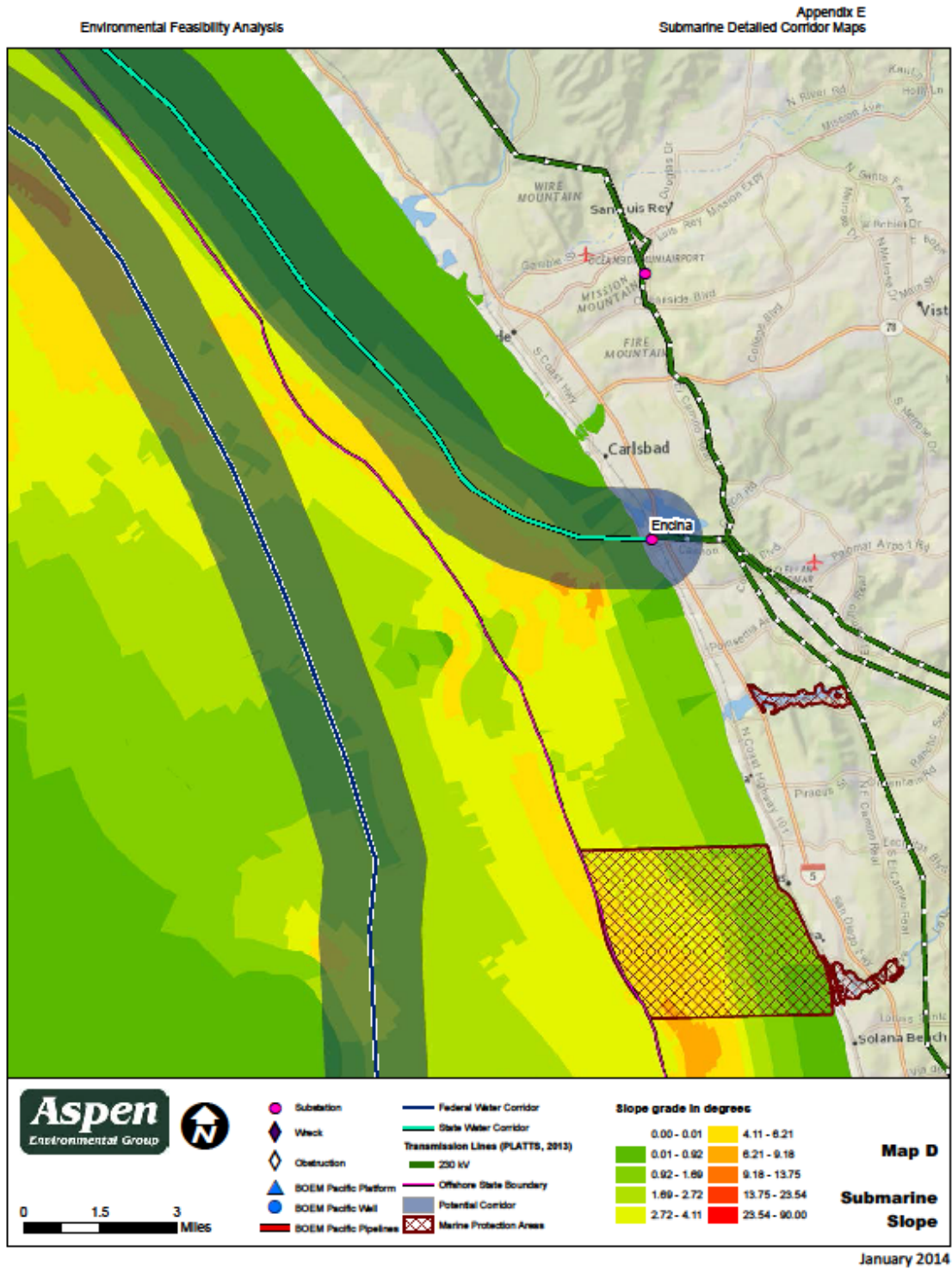
Source: Aspen Environmental 2014

## Map E-9 Submarine Slope



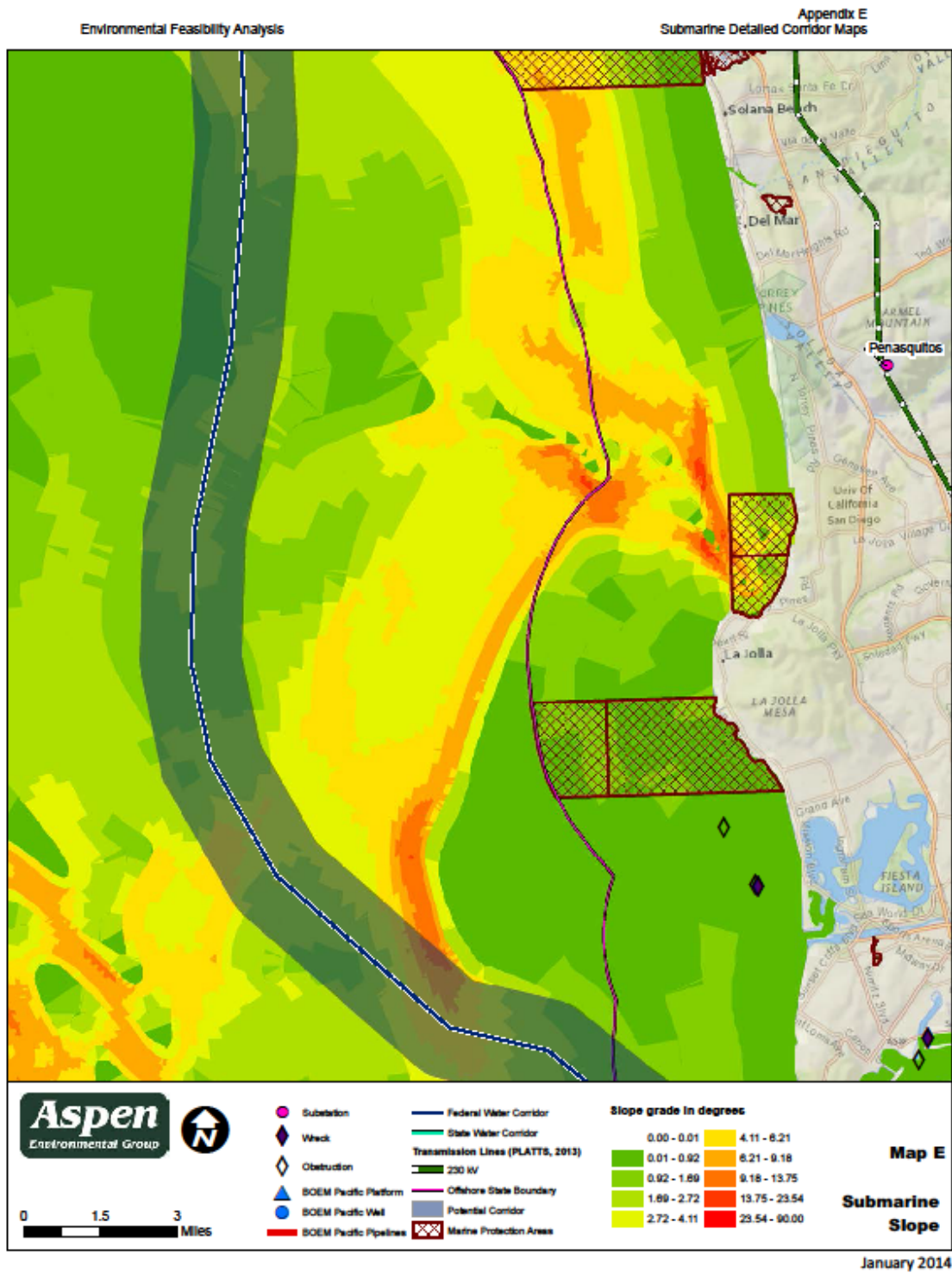
Source: Aspen Environmental 2014

# Map E-10 Submarine Slope



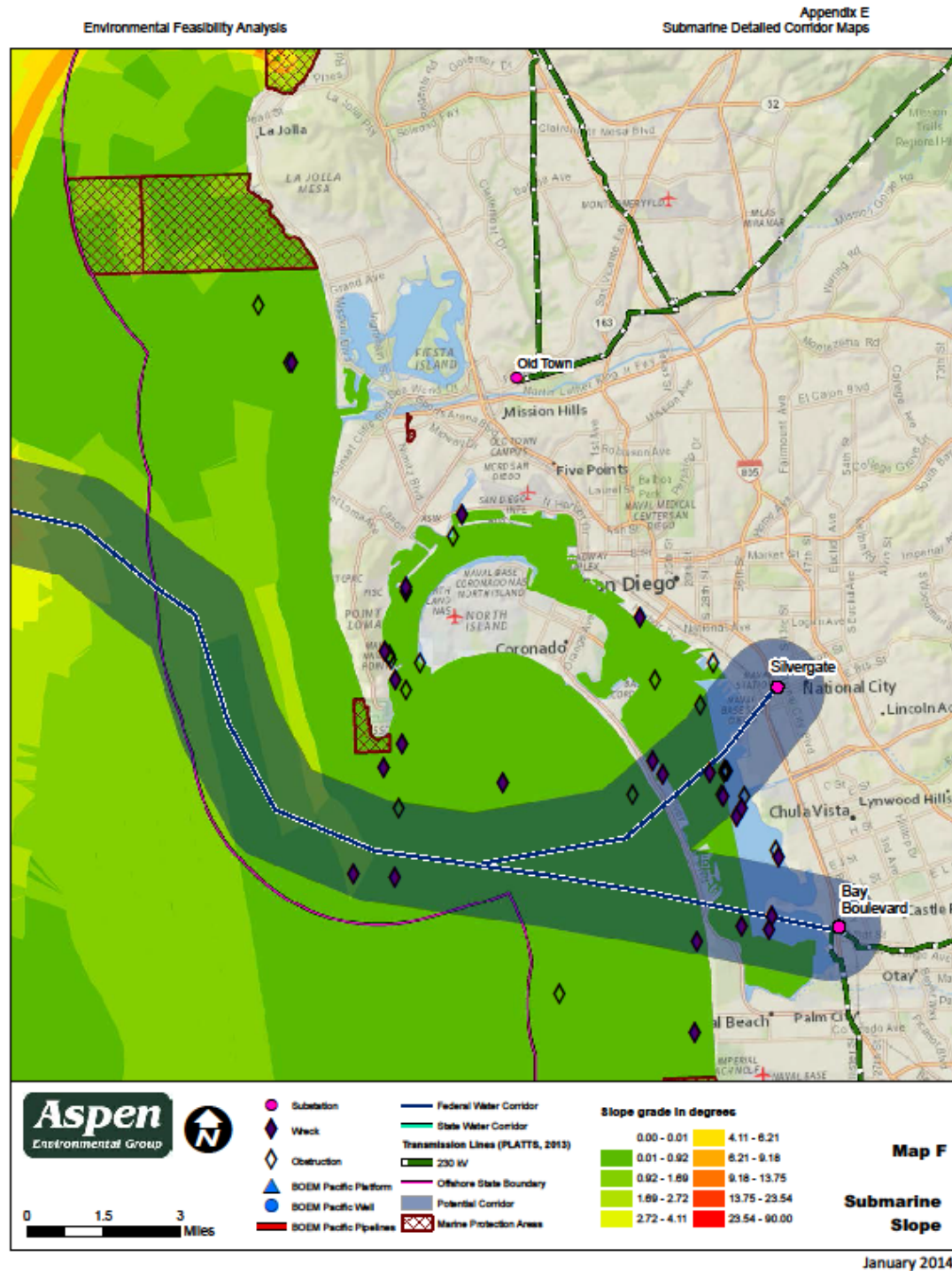
Source: Aspen Environmental 2014

# Map E-11 Submarine Slope



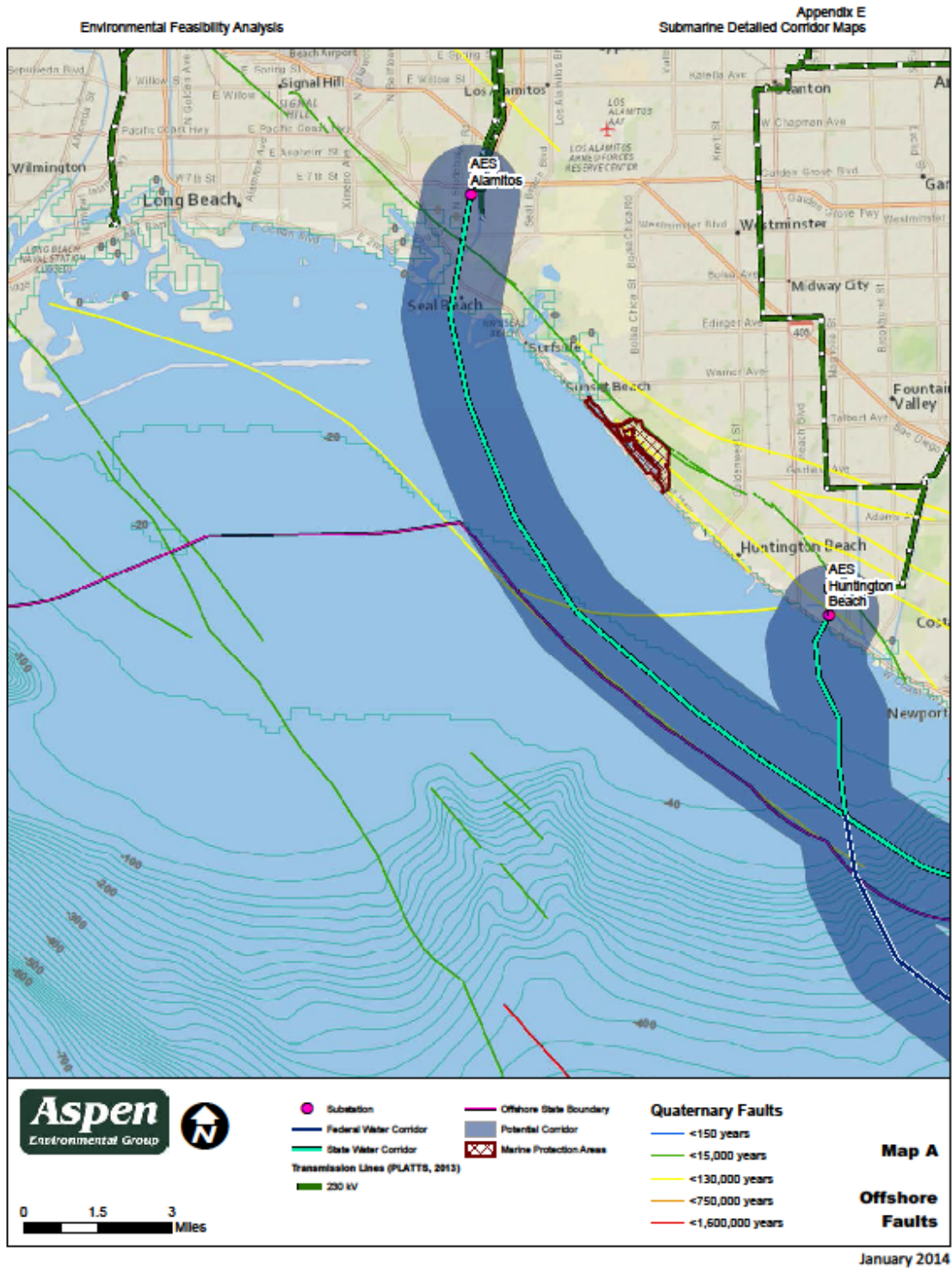
Source: Aspen Environmental 2014

## Map E-12 Submarine Slope



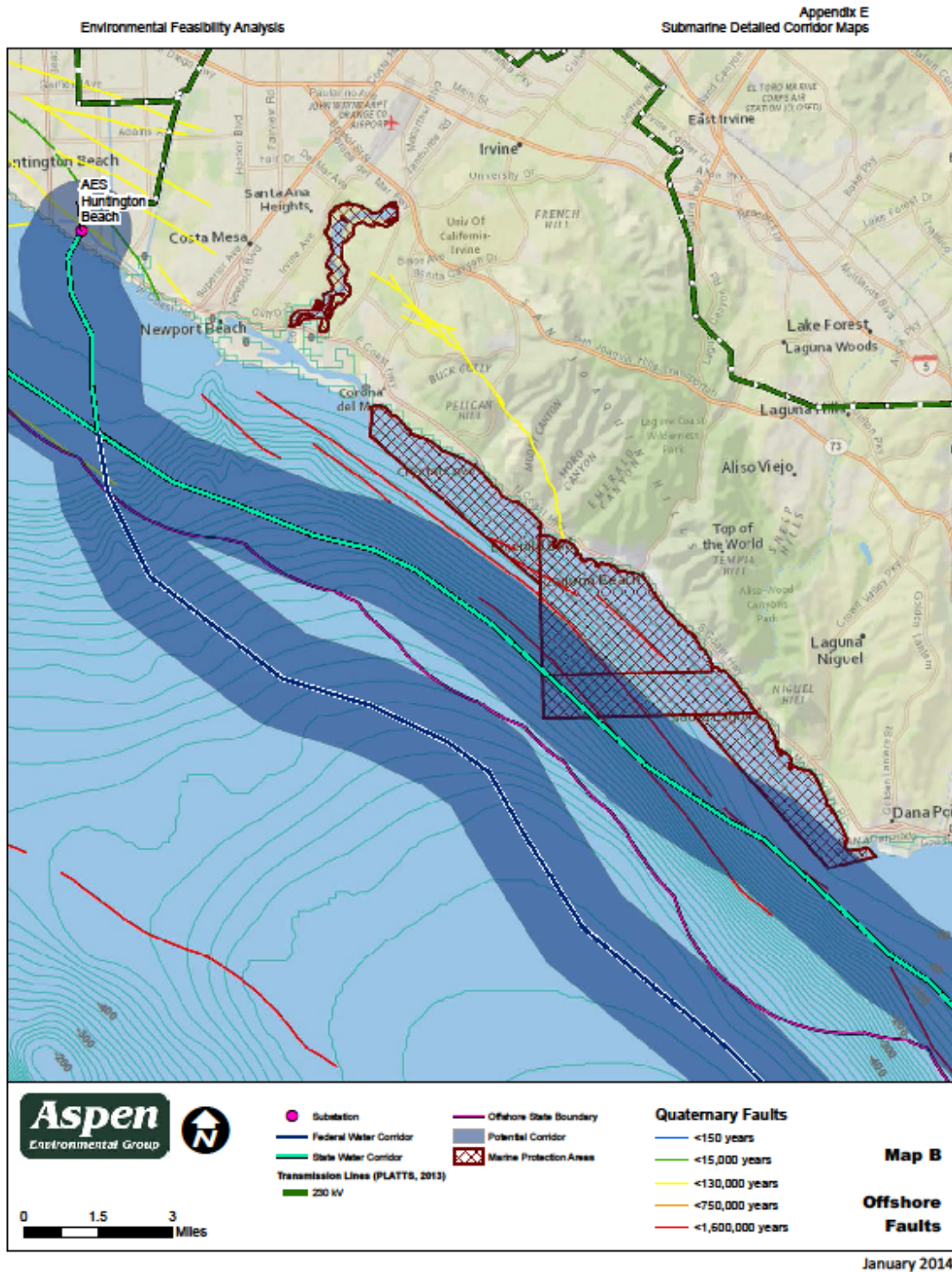
Source: Aspen Environmental 2014

# Map E-13 Offshore Faults



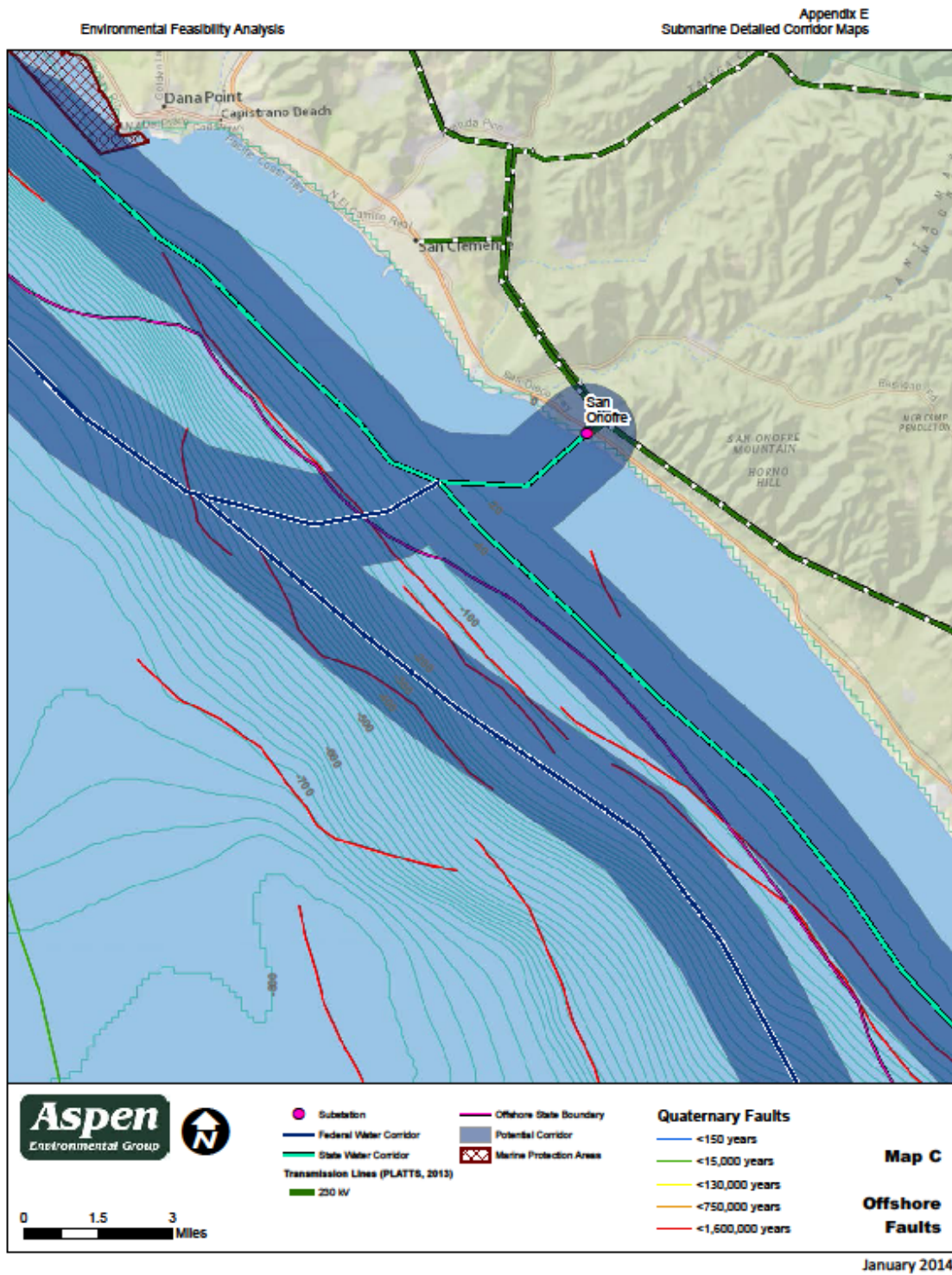
Source: Aspen Environmental 2014

# Map E-14 Offshore Faults



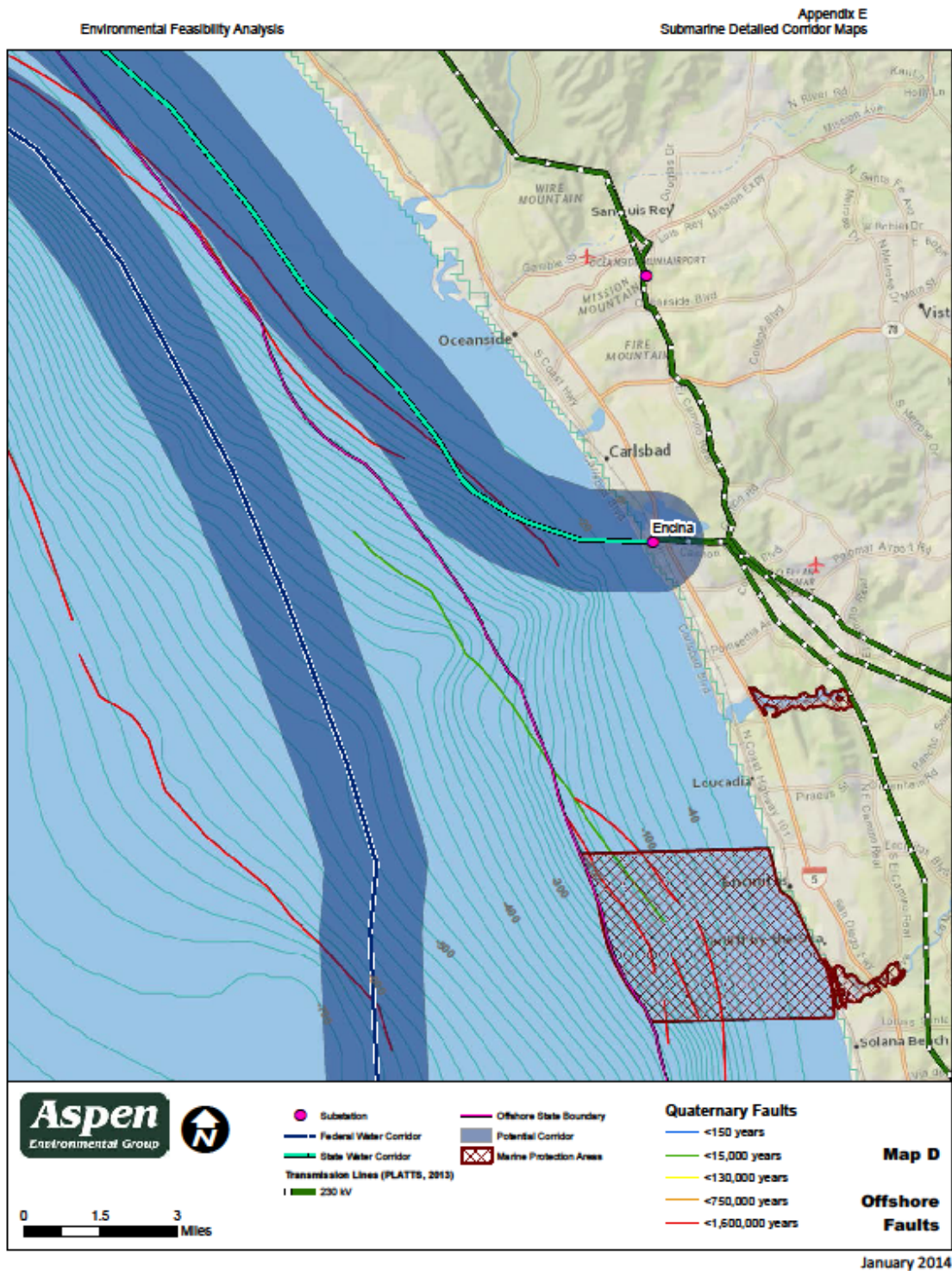
Source: Aspen Environmental 2014

## Map E-15 Offshore Faults



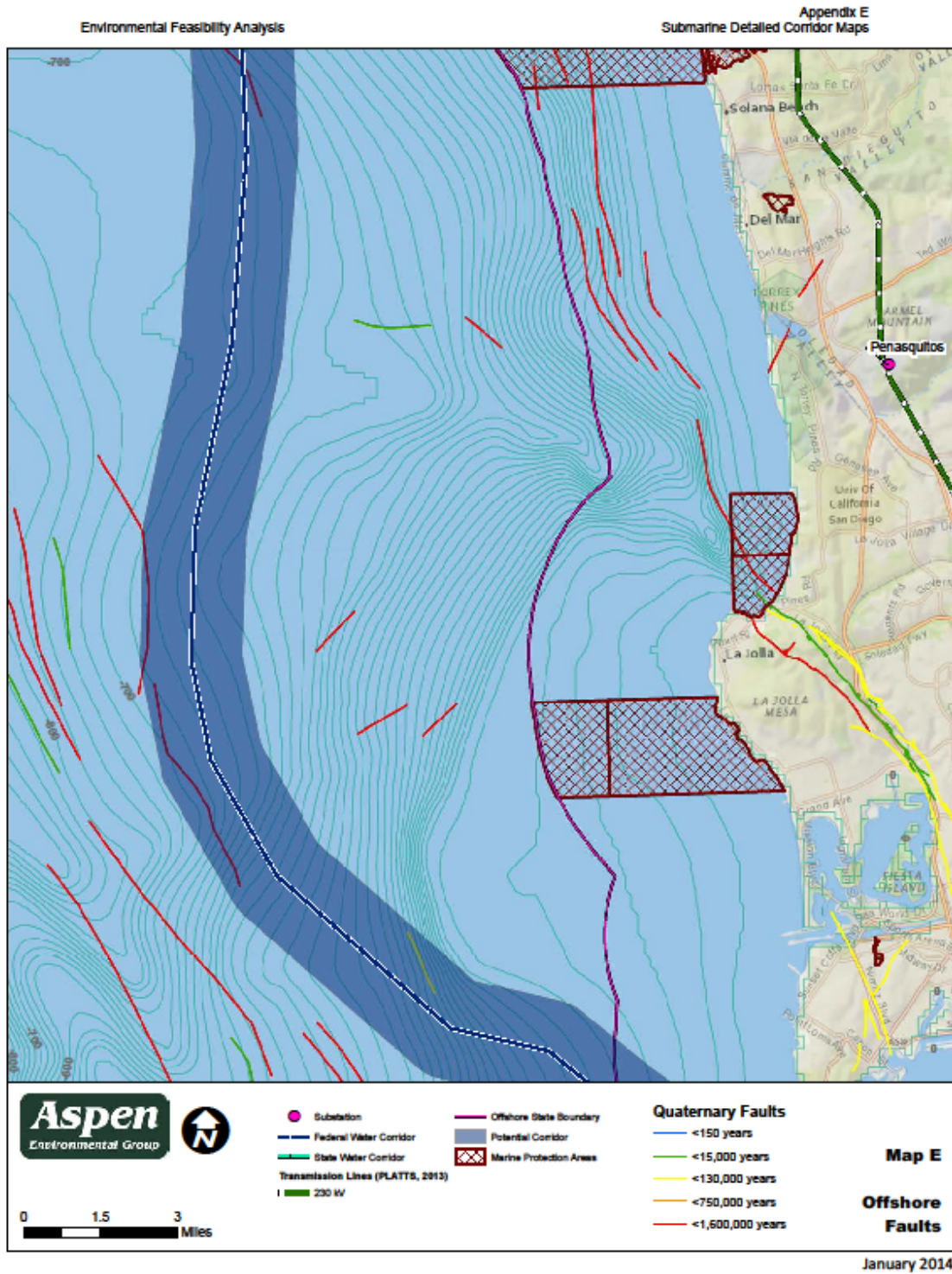
Source: Aspen Environmental 2014

# Map E-16 Offshore Faults



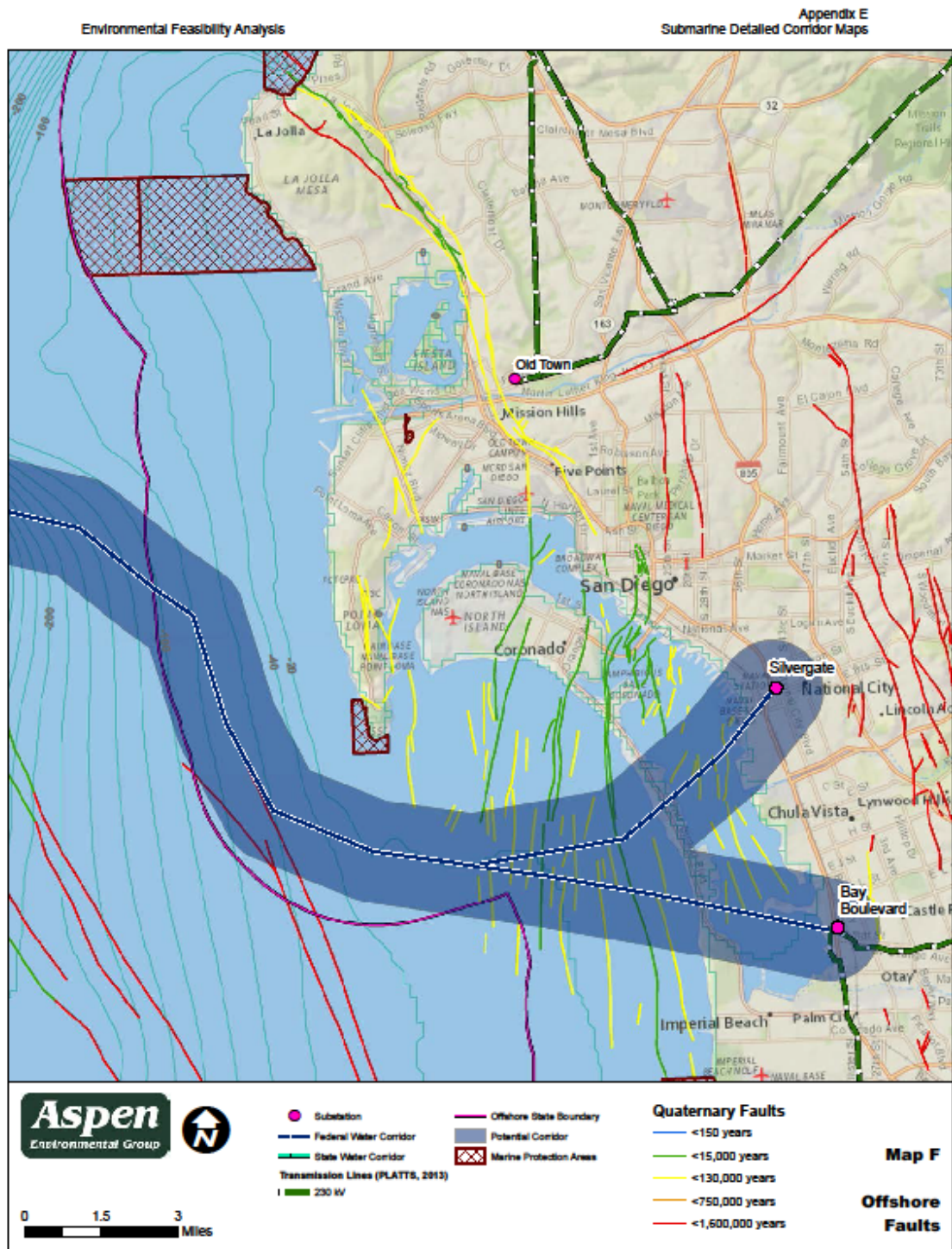
Source: Aspen Environmental 2014

## Map E-17 Offshore Faults



Source: Aspen Environmental 2014

# Map E-18 Offshore Faults



January 2014

Source: Aspen Environmental 2014